Subject name: **Linear Algebra**	**Neptun code:**
Responsible Lecturer: **Dr. Béla Kovács**, senior lecturer, PhD, CSc	
Co-Lecturer(s): -	
Suggested semester: 1. semester	**Preliminary requirements: -**
Classes per week: **Theoretical: 2** **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Students can use the knowledge to understand and write down processes in their mathematical elements.

Knowledge:

They have comprehensive knowledge of the basic facts, directions and boundaries of logistics

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.

They can apply the principles and methods of calculation and modelling of logistical processes.

Attitude:

They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations.

Subject description:

A concise but informative description of the knowledge to be acquired. The 3-dimensional real vectorspace, vector algebra, equations of straight and plane, vector spaces, linear dependence, independence, base, dimension, complex numbers, operation, polynomials, operations radical factor shape, matrices, matrix operations, matrix rank, determinant, matrix inverse, base transformation, homogeneous and inhomogeneous systems of linear equations, solvability, solution methods, linear mappings, characteristic polynomial, eigenvector, eigenvalue, diagonalizability, the real number n's are spaces.

Assignment and requirements of signature:

Active participation in exercises; successfully (at least 50%) writing the mid-year midterm thesis.

Requirement end evaluation of the practical mark/ exam:

To complete the subject, it is necessary to pass a written exam, which consists of theoretical and practical tasks

Required readings:

1. Jim Hefferon: Linear Algebra, 4. edition (2020) https://joshua.smcvt.edu/linearalgebra/book.pdf
2. David Cherney, Tom Denton, Rohit Thomas, Andrew Waldron: Linear Algebra, 1. Edition. Davis California, (2013); https://www.math.ucdavis.edu/~linear/linear-guest.pdf

Suggested readings:

1. Kenneth Hoffman, Ray Kunze: Linear Algebra 4. Edition Released: Prentice-Hall, Inc. Englewood Cliffs, New Jersey (1971); https://www.math.pku.edu.cn/teachers/anjp/textbook.pdf
2. Stephen Boyd, Lieven Vandenberghe: Introduction to Applied Linear Algebra; Vectors, Matrices, and Least Squares, Cambridge University Press (2018) DOI: 10.1017/9781108583664; https://web.stanford.edu/~boyd/vmls/vmls.pdf

Subject name: **Mathematics in Logistics I.**	**Neptun code:**
Responsible Lecturer: **Dr. Béla Kovács**, senior lecturer, PhD, CSC	
Co-Lecturer(s):	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 6	**Program:** Full time

Objective and purpose of the subject:
Basic concepts of mathematics, that can applied in Logistics.

Knowledge:
They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
Skills:
They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
They can apply the principles and methods of calculation and modelling of logistical processes.
Attitude:
They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
Autonomy and responsibility:
They make independent and professionally well-founded decisions even in unexpected decision-making situations.

Subject description:
Set theory, relations, functions, range of interpretation, set of values, series, limit of series, limit of univariate real functions, continuity, notable curves, differential calculus and its applications, function testing, indefinite integral calculus, rules of integration. The definite integral and its applications, impropius integral.

Assignment and requirements of signature:
Active participation in exercises; successfully (at least 50%) writing the mid-year midterm thesis.

Requirement end evaluation of the practical mark/ exam:
To complete the subject, it is necessary to pass a written exam, which consists of theoretical and practical tasks

Required readings:

1. Vitali Liskevich Analysis 1Lecture Notes 2013/2014; University of Bristol https://people.maths.bris.ac.uk/~maxmr/analysis1/notes1.pdf
2. Joseph L. Taylor: Foundations of Analysis, Version 2.3, (2010) https://sites.math.washington.edu/~morrow/334_13/analysisTaylor.pdf
3. John K. Hunter: An Introduction to Real Analysis (2014),D epartment of Mathematics, University of California at Davis https://www.math.ucdavis.edu/~hunter/intro_analysis_pdf/intro_analysis.pdf

Suggested readings:

1. John E. Hutchinson: Introduction To Mathematical Analysis (1994) Department of Mathematics School of Mathematical Sciences ANU https://maths-people.anu.edu.au/~john/Assets/Lecture%20Notes/B21H_97.pdf
2. Elias Zakon: Mathematical Analysis Volume I (1975), The Saylor Foundation https://resources.saylor.org/wwwresources/archived/site/wp-content/uploads/2012/02/Real-Analysis-I-Zakon-1-30-11-OTC.pdf

Subject name: **Mathematics in Logistics II.**	**Neptun code:**
Responsible Lecturer: **Dr. Béla Kovács**, senior lecturer, PhD, CSC	
Co-Lecturer(s):	
Suggested semester: 2. semester	**Preliminary requirements: Mathematics in Logistics I.**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:
Basic concepts of mathematics, that can applied in Logistics.

Knowledge:
They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
Skills:
They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
They can apply the principles and methods of calculation and modelling of logistical processes.
Attitude:
They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
Autonomy and responsibility:
They make independent and professionally well-founded decisions even in unexpected decision-making situations.

Subject description:
The definite integral, its properties, areas of application. Improprius integrals. Bivariate functions. Numeric rows. Dual integral and its applications. Triple integral and its applications. Differential equations. Vector-scalar functions. Scalar vector functions. Vector-vector functions.

Assignment and requirements of signature:
Active participation in exercises; successfully (at least 50%) writing the mid-year midterm thesis.

Requirement end evaluation of the practical mark/ exam:
To complete the subject, it is necessary to pass a written exam, which consists of theoretical and practical tasks.

Required readings:

1. Joseph L. Taylor: Foundations of Analysis, Version 2.3, (2010) https://sites.math.washington.edu/~morrow/334_13/analysisTaylor.pdf
2. John E. Hutchinson: Introduction To Mathematical Analysis (1994) Department of Mathematics School of Mathematical Sciences ANU https://maths-people.anu.edu.au/~john/Assets/Lecture%20Notes/B21H_97.pdf
3. William Ted Martin, H. Spanier, G. Springer and P. J. Davis.: International Series In Pure And Applied Mathematics (1964) ISBN 0-07-054235-X https://web.math.ucsb.edu/~agboola/teaching/2021/winter/122A/rudin.pdf

Suggested readings:

1. http://www.ru.ac.bd/wp-content/uploads/sites/25/2019/03/205_04_Apostol-Mathematical-Analysis-1973.pdf
2. Christoph Thiele: Analysis II Lecture notes, (2016) https://www.math.uni-bonn.de/ag/ana/SoSe2015/analysis2/lecture_notes/Analysis_2.pdf

Subject name: **Fundamentals of Physics**	**Neptun code:**
Responsible Lecturer: **Dr. Gábor Pszota,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 2. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 1**	**Requirement type: exam**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

Summary of basic knowledge and concepts of Physics.

Knowledge:

They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.

Attitude:

They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations.

Subject description:

Fundamental concepts of kinematics. Newton's laws. Power, work, energy. Linear free oscillation. Forced oscillation. Electric charge, field, potential. Conductors in electric field. The flow of electric charges. Concept of current density and current. Conduction of current in metals. DC circuits. The integral form of Joule's law. The concept of magnetic induction. Forces in magnetic field. Dia-, para-, and ferromagnetism. Ampere's law. Electromagnetic induction. Neumann's law. Faraday's law of induction. AC current. Ampere-Maxwell law. EM waves.

Assignment and requirements of signature:

Mid semester test

Requirement end evaluation of the practical mark/ exam:

Exam

Required readings:

1. Sears and Zemansky: University Physics, PEARSON, 2015, ISBN: 978-1323142776
2. Alonso and Finn: Fundamental University Physics I, II, Addison-Wesley Pub., 1980. ISBN: 9780201000764, 9780201001624

Suggested readings:

Subject name: **Technical chemistry**	**Neptun code:**
Responsible Lecturer: **Dr. Ferenc Mogyoródy**, senior lecturer, PhD	
Co-Lecturer(s):	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 1**	**Requirement type: term mark**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

Summary of basic knowledge and concepts of technical chemistry, introduction to and mastery of the basics of special fields related to mechanical engineering, for example, lubrication, corrosion, etc. The lecture should cover the basic chemical knowledge essential for engineering practice.

Knowledge:

- They know the workplace and fire safety, safety technology requirements and standards, as well as the relevant environmental regulations related to logistics.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can plan, organise and carry out independent learning.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

General basic chemistry concepts: chemical substance, physical field, elements of atomic structure. Chemical bonds: first and second order bonds. States of matter and their characterization. Constituents and their changes. Equilibrium phase diagrams. Acids, bases, salts. Dissolution. Hydration, solvation, hydrolysis. Basic electrochemical concepts. Colloidal systems. Lubrication technology, basics of corrosion protection. Basics of environmental protection. Basics of organic chemistry and materials chemistry.

Assignment and requirements of signature:

The condition for obtaining the signature is the completion of at least an appropriate qualification level (min. 60%) of the theoretical knowledge-based thesis at the end of the semester.

Requirement end evaluation of the practical mark/ exam:

The practical grade is calculated based on the result of the closed-door written test at the end of the semester, the evaluation is graded in 5 grades: insufficient (1), sufficient (2), average (3), good (4), excellent (5).

Required readings:

1. Soren Prip Beier, Peter Dybdahl Hede: Chemistry -2nd edition, Ventus Publishing AsP, ISBN 978-87-7681-535-6, 2010.

Suggested readings:

1. Peter G. Nelson: Introduction to Inorganic Chemistry: Key ideas and their experimental basis, Ventus Publishing ApS, ISBN 978-87-7681-732-9

Subject name: **Statics**	**Neptun code:**
Responsible Lecturer: **Dr. Balázs Tóth,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 2. semester	**Preliminary requirements: Linear Algebra, Mathematics in Logistics I.**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Introduction to engineering mechanics. Fundamental concepts and models in mechanics.

Knowledge:

They know logistics processes, the ways in which they are carried out and their technical possibilities. They know the methods, implementation possibilities and practices of assessing basic logistics needs. They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities. They can apply the principles and methods of calculation and modelling of logistical processes. They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments. They monitor legislative, technical, technological and administrative changes related to logistics. They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations. They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

Equilibrium of a particle. Moment of a force about a point and an axis. Three-dimensional force systems acting on a rigid body. Resultants of a force and couple system. Equivalent and equilibrated systems of forces. The main theorem of statics. The Coulomb-model of dry friction. Supports for rigid bodies. Equilibrium of a rigid body. The free-body diagram. Distributed loading and its resultant. Center of gravity, center of mass and the centroid. Equilibrium of structures. Plane and space trusses. The method of joints and the method of sections. Internal forces and moments in structural members. Bars and beams. Equations of equilibrium for internal forces and moments. Axial force, shear force and bending moment diagrams. Cables.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Beer, F.P., Johnston, E.R., Mazurek, D.F., Cornwell, P.J.: Vector Mechanics for Engineers: Statics & Dynamics, McGraw-Hill, 2012
2. Bedford, A.M., Fowler, W.L.: Engineering Mechanics: Statics & Dynamics, Pearson 2022
3. Hibbeler, R.C.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022

Subject name: **Mechanics of Materials**	**Neptun code:**
Responsible Lecturer: **Dr. Sándor Szirbik,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 3. semester	**Preliminary requirements: Statics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Basic concepts of mechanics of materials. Introduction to matrix and tensor algebra.

Knowledge:

They know logistics processes, the ways in which they are carried out and their technical possibilities.
They know the methods, implementation possibilities and practices of assessing basic logistics needs.
They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
They can apply the principles and methods of calculation and modelling of logistical processes.
They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
They monitor legislative, technical, technological and administrative changes related to logistics.
They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations.
They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

Deformable bodies. Deformation gradient, displacement gradient. Strain tensor and rotation tensor. Stress tensor. The tension-compression test. Hooke's law, Poisson's ratio. Strain energy. Elastic deformation of an axially loaded member. Torsion of circular shafts. Bending of straight members. Shear in straight members. Moments of inertia for an area. Combined loading, design of beams and shafts. General equations of elasticity: equilibrium equations, kinematic equations, generalized Hooke's law. Mohr's circle. Principal stresses and strains. The concept of equivalent stress. Theories of failure. Deflection of beams and shafts. Curved beams. Statically indeterminate beams and shafts. Buckling and stability of columns.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. *Beer, F.P. - Johnston, E.R.: Mechanics of Materials, McGraw-Hill, 2007*
2. *Bedford, A.M., Liechti, K.M., Fowler, W.L.: Statics and Mechanics of Materials,Pearson, 2002*
3. *Hibbeler, R.C.: Mechanics of Materials, Pearson, 2022*

Subject name: **Dynamics**	**Neptun code:**
Responsible Lecturer: **Dr. Edgár Bertóti,** full professor, PhD, DSc	
Co-Lecturer(s):	
Suggested semester: 4. semester	**Preliminary requirements: Mechanics of Materials**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Basic concepts of dynamics in physical systems.

Knowledge:

They know logistics processes, the ways in which they are carried out and their technical possibilities. They know the methods, implementation possibilities and practices of assessing basic logistics needs. They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities. They can apply the principles and methods of calculation and modelling of logistical processes. They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments. They monitor legislative, technical, technological and administrative changes related to logistics. They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations. They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

Kinematics of a particle. Kinematics of a rigid body: translation and rotation, relations for velocities and accelerations. Relative-motion analysis of particles and rigid bodies. Kinetics of a particle. Newton's laws of motion. Principle of impulse and momentum. Power and work of a force. Principle of work and energy. Conservative forces and potential energy. Equation of motion for a system of particles. Kinetics of a rigid body. Linear and angular momentum. Moments of inertia. Tensor of inertia. Newton-Euler equations of motion for a rigid body. Kinetic energy of a rigid body. Power and work of system of forces acting on a rigid body. D'Alembert's principle. Constrained motions. Planar kinetics of a system of rigid bodies. One-degree-of-freedom vibration of a rigid body. Equation of motion, circular and natural frequency. Undamped, damped and forced vibrations. Resonance.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Beer, F.P., Johnston, E.R., Mazurek, D.F., Cornwell, P.J.: Vector Mechanics for Engineers: Statics & Dynamics, McGraw-Hill, 2012
2. Bedford, A.M., Fowler, W.L.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022
3. Hibbeler, R.C.: Engineering Mechanics: Statics & Dynamics, Pearson, 2022

Subject name: **Electrotechnics-Electronics**	**Neptun code:**
Responsible Lecturer: **Judit Somogyiné Dr. Molnár**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 3. semester	**Preliminary requirements: Fundamentals of Physics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Summary of basic knowledge and concepts of Electronics.

Knowledge:

They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
They know the measurement procedures used in logistics, their tools, instruments and measuring equipment.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities. They can connect sub-processes of logistics systems and the sub-units carrying out their functions (material handling equipment, sensors, actuators, control systems, database systems, etc.).

Attitude:

They share their experience with colleagues to help them grow.

Autonomy and responsibility:

They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

Introducing the basic electrical and magnetic phenomena, laws and circuit calculations in the case of direct current, single and three-phase alternating current excited networks. Introducing the main characteristics of equipment used in electrical energy generation, distribution, conversion and utilization (one and three-phase transformers, one and three-phase synchronous and induction machines, DC machines). Introducing semiconductors, diode, transistor, rectifier circuits, power electronic converters.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. William H. Hayt: Engineering Circuit Analysis with CD-ROM, McGraw-Hill, 2001, ISBN: 0072283645
2. Theodore Wildi: Electrical machines, drives and power systems, Prentice Hall, 2005, ISBN: 978-0131776913
3. Leon O. Chua, Charles A. Desoer, Ernest S. Kuh: Linear and nonlinear circuits, McGraw-Hill College, 1987, ISBN: 978-0070108981
4. Tietze, U., Schenk, Electronic Circuits - Handbook for Design and Applications, 2008, ISBN: 978-3-540-78655-9

Suggested readings:

1. Fraser, Milne: Integrated Electrical and Electronic Engineering for Mechanical Engineers, McGraw-Hill Publ., 1994, ISBN: 978-0077079734
2. https://www.khanacademy.org/science/physics/electrical-engineering
3. Robert W. Erickson, Dragan Maksimovic: Fundamentals of Power Electronics, 2001, ISBN: 978-0-306-48048-5

Subject name: **Occupational Health and Safety in Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Róbert Skapinyecz**, associate professor, PhD	
Co-Lecturer(s): Dr. Ákos Cservenák, senior lecturer, PhD	
Suggested semester: 2. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 0**	**Requirement type: term mark**
Credits: 2	**Program:** Full time

Objective and purpose of the subject:

During the course, the students are introduced to the basics of the occupational safety approach and its main areas of application in logistics, especially in the area of material handling. A basic presentation of regulatory environments and areas of expertise relevant to the above for the students.

Knowledge:

They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.

They know the workplace and fire safety, safety technology requirements and standards, as well as the relevant environmental regulations related to logistics.

Skills:

They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process. They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

They monitor legislative, technical, technological and administrative changes related to logistics. They are open to know, accept and credibly communicate professional and technological development and innovation in logistics. They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them. They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties. They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them. They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

The place and role of occupational health and safety in logistics. Getting to know the basic workplace hazards, as well as the basic methods and procedures for minimizing the risks they pose in relation to material handling systems. Getting to know the comprehensive organization and main areas of application of the relevant standards, provisions and regulations. Presentation of examples of correct and incorrect occupational health and safety practices.

Assignment and requirements of signature:

thematic tests

Requirement end evaluation of the practical mark/ exam:

thematic tests

Required readings:

1. Reese, Charles D. Occupational health and safety management: a practical approach. CRC press, 2018.

Suggested readings:

Friend, Mark A., James P. Kohn: Fundamentals of occupational safety and health, Rowman & Littlefield, 2018.

Subject name: **Rules of Logistics Processes**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Csilla Gabriella Csák**, full professor, PhD, CSC	
Co-Lecturer(s): Dr. jur. Balázs Szabó, assistant lecturer, PhD	
Suggested semester: 7. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 0**	**Requirement type:**
Credits: 1	**Program:** Full time

Objective and purpose of the subject:

Students learn about the laws and rules of inner and outer logistical processes, and with this knowledge they can design systems that is also legally accepted.

Knowledge:

They know the workplace and fire safety, safety technology requirements and standards, as well as the relevant environmental regulations related to logistics. They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

They can plan, organise and carry out independent learning. They can understand and use the literature, computer technology and library resources of logistics. They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards

Attitude:

They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world. They are committed to broad-based enforcement of health and environmental protection. They share their experience with colleagues to help them grow.

Autonomy and responsibility:

They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties. They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them. They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions. Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles. They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

The legal background and regulation of logistics processes, the system and practice of Hungarian legislation, the most important areas of regulations. The role of the state organization (with particular regard to the domestic administrative system and its authorities and bodies affecting the logistics sector) and private investments in the development and operation of logistics systems. Coordination of technical development and regulatory requirements, enforcement of standards, furthermore guidelines and recommendations, especially in the area of device development and system design. The safety technology of machine systems, unit loads, and transportation. Regulation of harmful effects on the environment, compliance with energy efficiency regulations. Insurance systems, risk analysis of complex processes. Authority activity and control systems. The social role of logistics companies, their impact on the economy, labor needs, human resources development. Effects of the EU and the global economy on regulation, harmonization issues.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Dr. Miro Cerar: The Relationship Between Law and Politics, 2009 https://digitalcommons.law.ggu.edu/cgi/viewcontent.cgi?article=1126&context=annlsurvey

2. United Nations Convention on Contracts for the International Carriage of Goods Wholly or Partly by Sea, 2009, https://uncitral.un.org/sites/uncitral.un.org/files/media-documents/uncitral/en/rotterdam-rules-e.pdf
3. Carriage of Goods by Air: A Guide to the International Legal Framework, 2006, https://unctad.org/system/files/official-document/sdtetlb20061_en.pdf

Subject name: **Basics of Economics**	**Neptun code:**
Responsible Lecturer: **Andrea S. Gubik**, associate professor (GTK)	
Co-Lecturer(s):	
Suggested semester: 3rd semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 1 **Practical: 1**	**Requirement type: exam**
Credits: 2	**Program:** Full time

Objective and purpose of the subject:

The aim of the course is to provide a basic knowledge of economics for engineering students who will be working in an economic environment at some level and will encounter economic issues in their work. In order to achieve this objective, the curriculum includes an introduction to the basic concepts of economics, an introduction to and interpretation of economic thinking.

Knowledge:

They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes. They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities. They can apply the principles and methods of calculation and modelling of logistical processes. They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.

Attitude:

They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world. They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties. They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

The function of market. Supply and demand, market equilibrium. Consumer behavior. Modelling utility. The budget constraint. Optimal consumer choice, effects of price changes and income changes. The demand curve. Firm production in the short and long run. Costs of the firm. The perfectly competitive market. Forms of imperfect competition. Comparison of perfect competition and monopoly. Input demand of a perfectly competitive firm and a monopoly. Valuation of capital. Market failures. Indicators of macroeconomics. National income: production, distribution, consumption. Economic growth. Relationship between labor, goods, and money markets. Economic fluctuations. Inflation. Phillips curve: the relationship between inflation and unemployment.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Varian, H.L. (2019): Intermediate microeconomics: A modern approach. Ninth Edition. Norton & Comp, New York/London (ISBN 978-0-393-68986-0)
2. Gubik, S.A., Kis-Orloczki, M (2013). Student workbook of Microeconomics (e-book only) http://gtk.uni-miskolc.hu/gei/micro

3. Mankiw, N.G. (2022). Macroeconomics. Eleventh Edition Macmillan (ISBN:9781319263904)
4. Gubik, S.A., Kis-Orloczki, M (2013). Student workbook of Macroeconomics (e-book only) http://gtk.uni-miskolc.hu/gei/macro

Suggested readings:

1. Heyne, P.L., Boettke, P.J., Prychitko, D.L. (2014): Economic Way of Thinking, The 13th Edition. Pearson (ISBN-13: 9780132992695)
2. Miller, R.L. (2021): Economics Today: The Micro View, 20th Edition. Pearson (ISBN-13: 9780135857458)
3. Samuelson, P.A., Nordhaus, W.D. (2010): Microeconomics: A version of economics. 19th Edition. McGraw-Hill, New York (ISBN10: 0073511293)
4. Blanchard, O. (2021) Macroeconomics, 8th Edition. Pearson (ISBN-13: 9780136713883)
5. Miller, R.L. (2021): Economics Today: The Macro View, 20th Edition. Pearson (ISBN-13: 9780136714071)
6. Snowdon, B. Vane, H. R. (2005) Modern macroeconomic: Its origins, development and current state. Cheltenham Northampton: Elgar (1 84376 394 X)

Subject name: **Cost Analysis of Logistics Processes**	**Neptun code:**
Responsible Lecturer: **Dr. Zoltán Musinszki**, associate professor, Phd	
Co-Lecturer(s): Dr. Klára Szűcsné Markovics, associate professor, PhD	
Suggested semester: 4. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

The aim of this course is to provide an introduction to the methods of planning and analyzing the resource requirements and costs of logistics processes. The aim of the course is to enable students to make decisions on the basis of resource utilization and relevant indicators, and to meet the information needs of managers to an appropriate standard.

Knowledge:

They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment. They know the learning, knowledge acquisition, data collection methods of logistics, their ethical limitations and problem-solving techniques.

Skills:

They can apply the principles and methods of calculation and modelling of logistical processes. They can use their knowledge in a creative way to effectively manage the resources of the workplace. They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them. They share their experience with colleagues to help them grow.

Autonomy and responsibility:

They make independent and professionally well-founded decisions even in unexpected decision-making situations. They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

Basic concepts for cost analysis: cost, expenditure, expense. Classification of costs, accounting, and management content of costs. Methods of costing and cost allocation. The tasks, objectives, and role of cost analysis in business management. General methodology of cost planning and analysis. Planning of resource requirements and costs of logistics processes, analysis of variance between plan and reality. The basis for logistics decisions: efficiency and cost-effectiveness indicators for purchasing logistics, material handling and transport, warehousing and picking, and distribution logistics. Preparing reports and accounts for managers and external users. Formulating management information requirements and exploiting data assets.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Material for lectures - https://elearning.uni-miskolc.hu/
2. Musinszki Z.: Cost to be a cost? Cost in the management accounting. In: Zéman, Zoltán (szerk.) Controller Info Studies I. Budapest, Copy & Consulting Kft. (2014) pp. 134-138.
3. Musinszki Z.: Hierarchies and dimensions in the service of cost controlling. In: Zéman, Zoltán (szerk.) Controller Info Studies I. Budapest, Copy & Consulting Kft. (2014) pp. 129-133.

Suggested readings:

1. Björn Oskarsson: Total Cost Analysis in Logistics, Linköping University, Linköping, Sweden, 2019.
2. Victor E. Sower, Christopher H. Sower: Better Business Decisions Using Cost Modeling: For Procurement, Operations, and Supply Chain Professionals, Business Expert, 2011.
3. Drury, C.: Management and Cost Accounting, 7. kiadás, Thomson Learning, 2008.
4. Matthew Zander: Supply Chain Cost Control Using Activity-Based Management, Auerbach Publications, 2006.

Subject name: **Accounting**	**Neptun code:**
Responsible Lecturer: **Dr. Judit Füredi-Fülöp**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

By mastering the requirements of the subject, the student will acquire the basic knowledge of the operation of the accounting information system, the process and framework of accounting activity, and the methodological foundations of accounting. The students will be able to review accounting processes, to take a systems approach, to define the place of accounting among the economic sciences.

Knowledge:

- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

- The place and role of accounting within economics.
- The concept of wealth in accounting. Content of asset and liability categories.
- Detailed content of balance sheet items.
- Accounting regulation and governance in Hungary.
- The Accounting Act and related government regulations.
- The role of balance sheet and economic transactions, general ledger accounts.
- Types of accounting. Cost concepts. Introduction of cost and profit and loss accounts. The single chart of accounts. The chart of accounts. Cost accounting methods.
- Interpretation of income and expenditure in accounting. The derivation of profit and loss, types of profit and loss account.
- Valuation of assets and liabilities: information needed to draw up the balance sheet, valuation procedures, valuation principles, balance sheet theories, depreciation.
- Framework for accounting activity: accounting principles, content of accounting policies, how they are drawn up.
- Function of the accounting information system. The process of accounting activity. Basis of accounting information.
- Closure of the financial year - closing operations.
- International accounting practice.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Material for lectures: https://elearning.uni-miskolc.hu/ 2. Kevin J. Hastings: Introduction to Financial Mathematics Taylor and Francis 2016 ISBN: 978-1498723909 3. B. Elliott, J. Elliott: Financial accounting and reporting, Financial Times Prentice Hall, 2008
Suggested readings: 1. Rose Peter – Hudgins Sylvia: Bank Management & Financial Services McGraw-Hill 2012 ISBN: 9780078034671 2. Dr. Chandra Shekhar: INTRODUCTION TO ACCOUNTING: http://www.ddegjust.ac.in/studymaterial/bba/bba-104.pdf 2021 10 11

Subject name: **Performance Management**	**Neptun code:**
Responsible Lecturer: **Veresné Prof. Dr. Mariann Éva Somosi**, full professor, PhD, CSc	
Co-Lecturer(s): Daniella Kucsma , assistant lecturer	
Suggested semester: 5. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 0**	**Requirement type: exam**
Credits: 2	**Program:** Full time

Objective and purpose of the subject:

Basic concepts of management, that can be applied in Logistics.

Knowledge:

- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know organisational, management and communication techniques.

Skills:

- They can organise, manage and control the operation of logistics systems.
- They can manage and control logistics processes, considering the elements of quality assurance and quality control.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts.
- They share their experience with colleagues to help them grow.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

The scientific field of performance management, the importance of performance management. Basic concepts related to performance. Levels of performance. The relationship between HRM and performance management. Areas of performance management. The performance management system (problems and shortcomings of preventive systems). The cycle and process of performance management. The importance of performance measurement. Performance management philosophy, performance prism. Performance models, BSC. Place of performance evaluation in the organization. The purpose of the performance evaluation. The appraisers and the appraised. 360° evaluation. Subject and approaches of evaluation. Evaluation techniques. Conditions of performance evaluation. Timing and frequency of performance evaluation. Communication of the performance assessment within the organization.

The evaluation interview and its goals, applied styles. Factors of success and failure. Pitfalls of performance appraisal. The basis of the performance evaluation: judgment. The person perception process. Detection errors.
Assignment and requirements of signature:
Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Lebas, M.J. (1995) Performance Measurement and Performance Management. International Journal of Production Economics, 41. 2. Satterfield T. (2003), From performance management performance leadership, Worldat-Work Journal, First Quarter
Suggested readings:

Subject name: Organization-Management	**Neptun code:**
Responsible Lecturer: **Veresné Prof. Dr. Mariann Éva Somosi**, professor, PhD, CSs	
Co-Lecturer(s): Daniella Kucsma, assistant lecturer	
Suggested semester: 6. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

Basic concepts of management, that can applied in Logistics.

Knowledge:

They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment. They know organisational, management and communication techniques

Skills:

They can organise, manage and control the operation of logistics systems. They can manage and control logistics processes, considering the elements of quality assurance and quality control. They can use their knowledge in a creative way to effectively manage the resources of the workplace. They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

They monitor legislative, technical, technological and administrative changes related to logistics. They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them. They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts. They share their experience with colleagues to help them grow.

Autonomy and responsibility:

They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties. They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions. Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles. They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

Basic concepts of management. Change-management. Leadership style, leadership roles, motivation. Organization planning, organizational structure. Organizational forms, Apples and Oranges case study. Divisional organizations, matrix organizations. Situation management (Hersey - Blanchard). Organization formation process. Basic elements of organization planning, Belbin test - group dynamics. Purpose and steps of process organization. Managerial decision making. Development of decision and information systems. Creating and managing groups. Organizational culture: welcome to my village. Conflict management. Control and communication.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Hersey – Blanchard – Johnson: Management of organizational behavior. Prentice Hall, 2007.
2. French, Ray – Rayner, Charlotte – Rees, Gary – Rumbles, Sally (2008): Organizational Behaviour, John Wiley & Sons, Ltd. Sussex

Suggested readings:

1. Morgan, Gareth (2006): Images of Organization. Thousand Oaks: Sage Publications, Inc.
2. Schein, Edgar H. (2006): Organizational Culture and Leadership, John Whiley & Sons

Subject name: Operation of Corporate Management Systems	**Neptun code:**
Responsible Lecturer: **Viktor Lates,** senior lecturer	
Co-Lecturer(s):	
Suggested semester: 6. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Using system-theory to describe how companies and corporate governance systems work. Types of company management systems: transaction processing, management information systems, decision support systems, senior management information systems. Other information systems supporting company processes. The role of the communication chain in the transmission of data and information in the operation of information systems, and the requirements for corporate management systems. The structure of corporate management systems and their relationship with the corporate organization, Modeling of corporate management systems: structure, operation and states. The development process, the possibilities and requirements of the introduction. Elements of systems maintenance. The task of information security in corporate management systems: types of risks, possible solutions. Elements of the ISO 27000 standard system. GDPR requirements and their fulfillment in corporate management systems.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know organisational, management and communication techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can apply the acquired IT knowledge in solving the tasks arising in transportation and shipment.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:
History and characteristics of the SAP S/4 HANA system. Operation and use of SAP enterprise management systems. Commonly used modules. Create and search in transactions and documents. Steps of the standard material procurement process in the SAP system. Purchase order, management of material receipts. Inquiries related to procurement and material handling. Tasks and operation of the production planning module in the SAP system. Forecasting data and material requirements planning in the SAP system. Mapping the discrete manufacturing process. Queries used for production process.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Olaf Shulz: Using SAP: An introduction for Beginners and Business Users (3rd ed.), SAP Press, Rheinwerk Publishing , Boston, 2017.
2. Mária Illés (2012): Transforming the Net Present Value for a Comparable One. Theory Methodology Practice: Club of Economics in Miskolc:(1) pp. 24-32.

Suggested readings:

1. Peter Atrill, Eddie McLaney (1999) Management Accounting for Decision Makers. Sixth Edition. Pearson Education Limited. Harlow, England (561 pages). http://elibrary.com.ng/UploadFiles/file0_10055.pdf

2. Peter Verdaasdonk (1999). Accounting information for operations management decisions. Technische Universiteit Eindhoven DOI: 10.6100/IR519787 (184 pages)

Subject name: **Materials Science and Testing**	**Neptun code:**
Responsible Lecturer: Dr. **Péter Zoltán Kovács,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Introduction to material-related engineering concepts, acquisition of the basic knowledge necessary to develop an engineering approach, definition of the main material properties and an overview of their definition options, exploration of the relationship system of material properties and material structure and the principle possibilities of modifying properties.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the measurement procedures used in logistics, their tools, instruments and measuring equipment.
- They know the learning, knowledge acquisition, data collection methods of logistics, their ethical limitations and problem-solving techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Introduction to material-related engineering concepts, acquisition of the basic knowledge necessary to develop an engineering approach, definition of the main material properties and an overview of their definition options, exploration of the relationship system of material properties and material structure and the principle possibilities of modifying properties.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Tisza, M.: Physical metallurgy for engineers by Materials Park, Ohio : ASM International ; London : Freund Pub. 2001. p. 421. (ISBN 087170725X)
2. Callister, W. D: Material Science and Engineering, John Wiley& Sons, New York, 1994. p. 721.

Suggested readings:

Subject name: **Mechanical Technologies**	**Neptun code:**
Responsible Lecturer: **Dr. László Kuzsella,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 2. semester	**Preliminary requirements: Materials Science and Testing**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Introduction to material technologies, such as heat treatment, forming, casting and welding of materials. It describes the theoretical background and the most relevant technologies beside of these fields.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the measurement procedures used in logistics, their tools, instruments and measuring equipment.
- They know the learning, knowledge acquisition, data collection methods of logistics, their ethical limitations and problem-solving techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

The student will be able to apply the most important terminologies, theories, and procedures of the given technical fields when performing related tasks. Able to identify routine professional problems, to explore the theoretical and practical background necessary for their solution, to formulate them and to solve them (with the practical application of standard operations).

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Tisza, M.: Physical metallurgy for engineers by Materials Park, Ohio : ASM International ; London : Freund Pub. 2001. p. 421. (ISBN 087170725X)
2. Callister, W. D: Material Science and Engineering, John Wiley& Sons, New York, ISBN-10: 0471736961, 2006
3. G. Krauss: Steels and its Heat Treatment - ASM International, ISBN-087170370X, 2002
4. Lange, K.: Metal Forming, McMillan Co. New York, 1983.
5. Cynthia L. Jenney: Welding Handbook, Welding Science and Technology, American Welding Society, 0-87171-657-7, 2001.

Suggested readings:

Subject name: **Fundamentals of Machine Elements**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Gabriella Vadászné Bognár,** professor, DSc	
Co-Lecturer(s): Dr. Ágnes Takács, associate professor, PhD	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

The aim of the course is to acquaint students with the various machines, machine elements, their mechanism of operation and to use the basic physical connections in practice.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know logistics processes, the ways in which they are carried out and their technical possibilities.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.

Subject description:

Mechanical work and performance in motion on straight line. Sliding friction and rolling resistance. Weightlifting work, potentional energy. The law of conservation of energy in a closed mechanical system. The force of acceleration and inertia. Characteristics of rotating motion. Torque work and performance. Efficiency, machine losses, energy figures. Periodic motion of machines. Bevel gear, crank gear. Determination of motion characteristics. Main types of gears. The flywheel, the degree of inequality. Drive systems. Friction drive. Flexible drive. Gear drive. Brakes, single-jaw and double-jaw brakes. Band brakes. Springs. The spring characteristic. Spring constant of a spring connected in series and in parallel.

Laboratory exercises:

- Measurement of coefficient of friction
- Measurement of flow losses

Gear pump capacity and volumetric efficiency

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. P. Sandori: The Logic of Machines and Structures (Dover Books on Engineering) Dover 2016.
2. M. Clifford, R. Brooks, A. Howe, A. Kennedy, S. McWilliam, S. Pickering, P. Shayler, P. Shipway: An Introduction to Mechanical Engineering Part I. Hodder Education Co, UK 2009.

Suggested readings:

1. R.C. Hibbeler: Engineering Mechanics, 14. Edition, Pearson Education Inc, 2016.
2. K. Otto - K. Wood: Product Design, Prentice Hall, New Jersey, 2001.

Subject name: **Vehicle Components**	**Neptun code:**
Responsible Lecturer: **Dr. Ferenc Sarka,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 2. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The aim of the subject is to wide the horizons of the students. The subject is used for individual logistical purposes, or describes the basic characteristics of usable vehicles and the tracks and roads they use, with increased emphasis placed on independent work and continuous discussion of topics.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know logistics processes, the ways in which they are carried out and their technical possibilities.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can plan, organise and carry out independent learning.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Robert C Juvinal - Kurt Marshek: Fundamentals of Machine Component Design, John Wiley & Sons, New York, 2000, ISBN 0-471-24448-1
2. Heinrich Riedl: Handbuch praktische Traktorentechnik Gebundene Ausgabe, Ulmer, 2014.
3. Colin Garratt: Illustrated Guide to Locomotives of the World, ISBN10 0857233734, Anness Publishing

Subject name: **Basics of Technical Description**	**Neptun code:**
Responsible Lecturer: **Dr. Erika Szilvásiné Rozgonyi**, associate professor, PhD	
Co-Lecturer(s): Sándor Lajos, master lecturer	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Summary of basic knowledge and concepts of Technical Descriptions, planning and drawing as an engineer

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know computer communication, major software applications in the field.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can understand and use the literature, computer technology and library resources of logistics.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations

Subject description:

Sketching in axonometry. Constructions in the representation of Monge, mapping of points, lines and planes, intersection problems. Introducing new image planes. Representation of circles. Representation of polyhedra and surfaces of revolution, and their intersection with plane. Preparations of technical drawings and documentations. Standards, drawing types, lines and captions, Views, section views, profiles for mechanical drawings. Special representation methods. Dimensioning, building of dimensions, special dimensions. Representation of threaded parts. The ISO tolerance system. Geometric and position tolerance, surface finishing. Connecting parts, ISO system of fits. The basics of Computer Aided Design (CAD), rapid prototyping.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Pottmann, H., Asperl, A., Hofer, M., Kilian, A.: Architectural geometry, Bentley Institute Press, 2010.
2. Creamer, Robert H.: Machine design. Addison-Wesley,1983.

Suggested readings:

1. Kathryn Holliday-Darr: Applied Descriptive Geometry, Delmar, 1998
2. Lee, Kunwoo: Principles of CAD/CAM/CAE Systems, Addison-Wesley, 1999.

Subject name: **Computer Studies**	**Neptun code:**
Responsible Lecturer: **Dr. Károly Nehéz**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 1. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Familiarization with the structure and operation of the Computers, building user competencies for the advanced use of MS Office applications, providing knowledge on the topic of viruses, developing intermediate C language programming skills.

Knowledge:

- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can plan, organise and carry out independent learning.
- They can apply the acquired IT knowledge in solving the tasks arising in transportation and shipment.

Attitude:

- They are committed to broad-based enforcement of health and environmental protection.
- They monitor legislative, technical, technological and administrative changes related to logistics.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.

Subject description:

- PC hardware basic concepts. A functional system diagram of a computer. The microprocessor. The bus. Memory, libraries. Turing machine. Neumann principle.
- Software basic concepts. Tasks of the operating system.
- Advanced Excel knowledge.
- The general structure of C programs. Data structures. In- and out.
- The concept of title, value, indicator. C language instructions. Branch organization, cycle organization.
- Basic algorithms interpreted on vectors. Structures. File management.
- Library functions. Computer viruses, protection.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Michael Vine: C Programming for the Absolute Beginner (2nd Edition) 2008.
2. T. Bailey: An Introduction to the C Programming Language and Software Design, 2005.
3. Alan Murray: Advanced Excel Success, Apress, 2020, ISBN-1484264665
4. John Michaloudis: 101 most popular excel formulas, 2019, ISBN: 1700300911

Suggested readings:

Subject name: **Control Engineering**	**Neptun code:**
Responsible Lecturer: **Dr. Attila Trohák,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 4. semester	**Preliminary requirements: Electrotechnics-Electronics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

In this course the students get familiar with the PLC and SCADA/HMI systems

Knowledge:

- They know the methods, implementation possibilities and practices of assessing basic logistics needs.

Skills:

- They can connect sub-processes of logistics systems and the sub-units carrying out their functions (material handling equipment, sensors, actuators, control systems, database systems, etc.).

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.

Autonomy and responsibility:

- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.

Subject description:

We learn about the structure, operation, and programming of PLC-based control systems. We deal with the basics of operation of sensors and actuators and their installation. We learn about structure, operation, and configuration of human-machine interfaces.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Hans Berger: Automating with SIMATIC S-1200, Publicis Publishing, 2011., ISBN 978-3-89578-356-2
2. Practical Industrial Programming using IEC 61131-3 for PLCs, IDC Technologies
3. David Bailey, Edwin Wright: Practical SCADA ofr Industry, Elsevier, 2003, ISBN 07506 58053
4. J. Park, S. Mackay, E. Wright: Practical Data Communications for Instrumentation and Control. Elsevier, 2003. ISBN: 07506 57979.

Suggested readings:

Subject name: **Basics of Manufacturing Technology**	**Neptun code:**
Responsible Lecturer: **Dr. Zsolt Maros,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 3. semester	**Preliminary requirements: Materials Science and Testing**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Main scientific fields, basic terms structure and systems approach characteristics of manufacturing technology

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.

Attitude:

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.

Autonomy and responsibility:

- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.

Subject description:

Manufacturing technological process. Cutting by tools with define edge geometry. Main characteristics of chip removal. Basic elements, workpiece, tool, movements cutting parameters. Edge geometry materials of cutting tools. Determination of cutting forces. Main cutting methods: turning, shaping, drilling, boring, face- and slab milling. Fine machining methods, grinding superfinishing, honing, lapping, polishing. Machining of gears and threads. Basics of industrial assembly. Activities and bonding methods. Production structure, assembly family tree, basics of assembly systems. Machine industrial measurements and their tools. Mechanical, optical, electrical and laser measuring devices used in length and angle measurements.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. E. Trent – P. Wright: Metal Cutting, Butterworth–Heinemann Boston, 2000, p446, ISBN 0-7506-7069-X
2. Heinz Tschätsch: Applied Machining Technology, Springer Dordrecht Heidelberg London 2008, p398, ISBN 978-3-642-01006-4

Suggested readings:

Subject name: **Material Handling Machines**	**Neptun code:**
Responsible Lecturer: **Dr. Péter Telek**, associate professor, PhD	
Co-Lecturer(s): Dr. Szabolcs Szentesi, senior lecturer, PhD	
Suggested semester: 3. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

Main objective of the course is to present the types, operation characteristics and elements of material handling machines for the students. During the semester the planning, operation and maintenance aspects of the machines are also presented. At the end of the course, students gain sufficient knowledge for the application, operation and control of handling machines. During the practical lessons students get deeper knowledge about the machines and apply the theoretical methods.

Knowledge:

- They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.
- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can organise, manage and control the operation of logistics systems.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Main topics of the course: Types, structures and functional elements of continuous and discontinuous material handling equipment. Calculation methods for the selection and analysis of the elements and parameters of typical piece handling machines. Planning methods of transport, loading and storing machines of bulk solids.

Assignment and requirements of signature:
thematic tests

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. R. A. Kulwiec: Materials handling handbook. J. Wiley and Sons, 1985.

Suggested readings:

1. D. McGlinchey: Bulk solids Handling, Blackwell Publishing, 2008.
2. P. M. McGuie: Conveyors. Application, selection and integration, CRC Press, 2010.

Subject name: **Fluid Transport Systems and Machines**	**Neptun code:**
Responsible Lecturer: **Dr. Péter Bencs,** associate professor, PhD.	
Co-Lecturer(s):	
Suggested semester: 4. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

Basic concepts of fluid dynamics and fluid transport, that can be applied in Logistics.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes.
- They know the measurement procedures used in logistics, their tools, instruments and measuring equipment.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can organise, manage and control the operation of logistics systems.
- They can detect errors in the logistics process and select remedial actions.
- They can plan, organise and carry out independent learning.
- They can apply the acquired IT knowledge in solving the tasks arising in transportation and shipment.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They pay attention to promoting professional development of their subordinates, managing and assisting them in their efforts.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

Properties of fluids (density, velocity field, streamlines, potential function, vorticity vector). Equation of continuity. Bernoulli equation for ideal and non-ideal, incompressible and compressible flows. Flow losses in pipelines and fittings. Equivalent pipe length. Classification of machines. Main characteristics of flow machines. External energy diagram of working machines. Realistic characteristic curves of pumps. Suction power of pumps. Working point of pumps, series and parallel connection. Starting and control of pumps. Types of water turbines. Characteristic curves of water turbines. Energy diagram and characteristic curve of fans. Fan types.

Assignment and requirements of signature:

The condition for acquiring a signature from the subject is that the student must attend at least 60% of the lectures and at least 70% of the practical lessons.

Requirement end evaluation of the practical mark/ exam:

The type of exam is oral (evaluation criteria according to faculty rules).

Required readings:

1. Roberson, J.A. - Crowe, C.T.: Engineering Fluid Mechanics. 3rd Edition, Houghton Mifflin Company, Boston, 1985.
2. Streeter, V.L. and Wylie, E:B.: Fluid Mechanics. McGraw-Hill, Auckland, 1987.
3. Philip M. Gerhart, Andrew L. Gerhart, John I. Hochstein: Munson, Young and Okiishi's Fundamentals of Fluid Mechanics, 8th Edition, Wiley Loose-Leaf Print Edition, 2018, ISBN: 978-1-119-54799-0

Suggested readings:

Subject name: **Technical Logistics**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás,** head of institute and full professor, PhD. dr. habil.	
Co-Lecturer(s): Dr. Péter Telek, associate professor	
Suggested semester: 2. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 3 **Practical: 2**	**Requirement type: exam**
Credits: 6	**Program:** Full time

Objective and purpose of the subject:

During the course, the students are introduced to the professional knowledge of logistics; to show the development of logistics and its relationship with material handling; determine the professional content of logistics; to develop the technical-logistics approach; explore the relational system of material and information flow; describe the main technical and IT equipment belonging to the operation of the logistics system.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Development of material handling, closed chain complex material flow system, structure of material flow system, LTS operations, concept of logistics, logistics as an integrated science, logistics principles and goals, logistics operations, logistics costs and performances, material and information flow of logistics system, mathematical methods of material flow description, logistics development trends, logistics concept, variants of logistics organization, procurement logistics process, JIT delivery, kanban delivery, production logistics process, distribution logistics process, recycling logistics process, logistics strategies.

Practice: Material handling techniques, types of cranes and their structural elements, structure and operation of types of forklifts, main types and structural elements of conveyor material handling equipment, material handling equipment with suspended rails, elements of roller track systems, main elements of belt conveyor equipment, design of warehouse systems.

Assignment and requirements of signature:

The condition for obtaining the signature is to achieve at least 50% of the maximum score that can be obtained for the closed-door thesis at the end of the semester, as well as to attend at least 60% of the classes held during the semester (§ 50 HKR)
Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007. 2. James M. Apple: Plant layout and material handling, John Wiley & Sons, ISBN 0471-07171-4
Suggested readings: 1. Davis, F. W., & Manrodt, K. B. (1991). Service Logistics: An Introduction. International Journal of Physical Distribution & Logistics Management, 21(7), 4–13., https://doi.org/10.1108/eum0000000000393

Subject name: **Logistics Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Ágota Bányainé Tóth,** associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 3. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to the planning and management methods of the various subsystems of the enterprise logistics system. The course will introduce the structure and main elements of the enterprise logistics system. The aim is to provide the theoretical basis for the optimal design and operation of logistics systems and to introduce the design principles, which can be further developed in the Master's programme.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment).

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

1. Structure of enterprise logistics system.
2. Strategic, tactical and operational level of enterprise logistics system.
3. Process of purchasing logistics.
4. Design and management methods of purchasing logistics.
5. Supplier evaluation methods.
6. Make or buy decision.

7. Just-in-time supply.
8. Process of production logistics.
9. Design and management methods of production logistics.
10. Process of distribution logistics.
11. Design and management methods of distribution logistics.
12. Process of reverse logistics.
13. Design and management methods of reverse logistics.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.
2. Gianpaolo Ghiani, Gilbert Laporte, Roberto Musmanno: Introduction to logistics systems management. Wiley 2013, ISBN: 978-1-119-94338-9

Suggested readings:

1. Rushton, A., Croucer, P., Baker, P.: The handbook of logistics and distribution management, 3rd edition, Kogan Page Limited, ISBN 9780749446697, 2006.
2. Gunasekaran A.: Agile manufacturing: The 21st Century Competitive Strategy, Elsevier, 2001. ISBN 978-0-08-043567-1

Subject name: **Simulation Modelling of Logistics Processes**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás**, head of institute, full professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Ákos Cservenák, senior lecturer, PhD	
Suggested semester: 3. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The course introduces the simulation modelling, evaluation and efficiency improvement capabilities of typical logistics systems. Using the knowledge gained, students will be able to model, evaluate, improve, and design logistics processes using a simulation framework.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know computer communication, major software applications in the field.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can apply integrated knowledge from the field of transportation, mobile machines, process theory, industrial production processes, as well as electronics and informatics.
- They can detect errors in the logistics process and select remedial actions.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.

Subject description:

Objectives for modelling logistics systems. Principles and possibilities of simulation modelling. Simulation in process improvement. Major logistic objects of complex systems and the material flow characteristics to be considered in their modelling. Methods to model logistics operations and processes in a simulation framework. Presentation of case studies on modelling and development of logistics systems. Solving practical problems.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Tamás, P.: Innovative simulation testing methods in logistics: Miskolc, 2021., ISBN: 978-963-358-239-8
2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4
3. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.

Suggested readings:

1. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.,
2. Tamás, P., Kovács, Gy.: Simulation methods in logistics: Miskolc, 2015., ISBN:978-963-358-120-9, 195 p.,

Subject name: **Transportation Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Róbert Skapinyecz**, associate professor, PhD	
Co-Lecturer(s): Dr. Ákos Cservenák, senior lecturer, PhD	
Suggested semester: 4. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 3 **Practical: 2**	**Requirement type: exam**
Credits: 6	**Program:** Full time

Objective and purpose of the subject:

During the course, introducing the students to the system-oriented transport curriculum is essential for the application of the complex logistics approach. To enable students to use the knowledge of other subjects to solve the transport logistics tasks of goods and passenger transport.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Characterization and development of transport systems, transport system connections. Transport sectors, transport technical systems, transport lanes, vehicles, energy supply, drive systems, transport service facilities. Trans-European networks (TEN) and pan-European corridors. Rail, road, water, air and combined transport. Environmental effects of transport, environmental impact, sustainability aspects. Evaluation and qualification of transport services, service quality assurance. Transport strategies, National Transport Strategy, EU Mobility Strategy. Introduction to the basics of traffic simulation software.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Taniguchi E., Thompson R. G., Yamada T., van Duin R.: City logistics: Network modelling and intelligent transport systems, Emerald Group Publishing Limited, 2001, ISBN 978-0-08-043903-7
2. Stroh, M. B.: A practical guide to transportation and logistics, Logistics Network Inc., 2006.

Suggested readings:

1. Tettamanti, Tamás, Tamás Lupsay, and István Varga. "Road Traffic Modeling and Simulation." (2019), Budapest, Hungary: Akadémiai Kiadó, ISBN 978 963 454 385 5
2. James H. Bookbinder: Handbook of Global Logistics Transportation in International Supply Chains, ISBN: 978-1-4419-6132-7, 2013

Subject name: **Basics of Process Development**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás**, head of institute, full professor, PhD, dr. habil.	
Co-Lecturer(s):	
Suggested semester: 4. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: term mark**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The course introduces the lean management philosophy and its tools. At the end of the course, students will be able to analyze and improve material flow systems in line with the lean philosophy.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know organisational, management and communication techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can detect errors in the logistics process and select remedial actions.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

The history of the development of Lean. 5 principles. Methods to define value-creating, non-value-creating processes, and losses (MURI, MUDA, MURA). Steps to draw a value stream map. Preparation of a present and future state map. Introduction to Lean tools (5S, Andon system, visual management principles, Poka Yoke, SMED, Pull principle, JIT, Kanban, Jidoka, Heijunka, Kaizen, etc.). Application of Lean tools in practice.

Assignment and requirements of signature:

Active participation in exercises; successfully (at least 50%) writing the mid-year midterm thesis.

Requirement end evaluation of the practical mark/ exam:

To complete the subject, it is necessary to pass a written exam, which consists of theoretical and practical tasks! Additional (specific) ways to be used in knowledge verification: none

Required readings:

1. Tamás, P.: Innovative simulation testing methods in logistics: Miskolc, 2021., ISBN: 978-963-358-239-8
2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4
3. Bartholdi, J. J., Hackman, S. T.: Warehouse & Distribution Science, Release 0.85, www.warehouse-science.com
4. Rother, M., Shook, J.: Learning to See: Value Stream Mapping to Add Value and Eliminate Muda, Lean Enterprise Institute, 2003.

Suggested readings:

1. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.
2. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.

Subject name: **Quality Assurance in Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Róbert Skapinyecz**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 6	**Program:** Full time

Objective and purpose of the subject:

During the course, students are introduced to the relationship system of quality assurance and logistics; comparison of quality assurance and logistics process based on material and information flow; tasks of quality assurance of the logistics process; quality assurance issues of the logistics activities of a manufacturing company; quality assurance issues of logistics activities of a service company; quality loop in logistics activity; logistical aspects of quality assurance standards.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can manage and control logistics processes, considering the elements of quality assurance and quality control.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Concept of quality, product quality, development of quality management, closed material flow system, concept of logistics, structure of corporate logistics, structure of the quality loop in a manufacturing company, material tracking models, product identification in quality assurance, quality loop in logistics services, types and purposes of audits, quality assurance standards, responsibility for processes , documenting processes.

Practice: Quality, quality assurance, quality policy, quality control, factors affecting quality, logistics information system and its requirements, elements that make up customer satisfaction, quality assurance of production process logistics, quality assurance in storage, design variants of product identification, case studies: audits, process structure development, quality assurance of logistics activities.

Assignment and requirements of signature:
thematic tests

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Pyzdek, Thomas, and Paul Keller. Handbook for quality management: A complete guide to operational excellence. McGraw-Hill Education, ISBN 978-0071799249, 2013.
2. Gianpaolo Ghiani, Gilbert Laporte, Roberto Musmanno: Introduction to logistics systems management. Wiley 2013, ISBN: 978-1-119-94338-9

Suggested readings:

1. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.

Subject name: **Service Logistics**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Tamás Bányai,** full professor, PhD, dr. habil	
Co-Lecturer(s): Dr. Róbert Skapinyecz, associate professor, PhD	
Suggested semester: 5. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical:** 0	**Requirement type: term mark**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to the logistics aspects of services. The course will introduce the typical service systems and the logistics tasks involved in their operation. The aim is to provide a theoretical basis for the planning and management of service tasks and to acquire knowledge of the operation of service systems that can be further developed in the Master's degree.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

1. Impact of globalisation on the production-services sector.
2. Development strategies of logistics services.
3. General models and characteristics of services.
4. Typical service groups, some areas of service logistics.
5. Logistics in health-care services.
6. Logistics in offices (banking).
7. Postal services.
8. Commercial logistics.
9. Logistics aspects of e-commerce.
10. Service network logistics.
11. Definition of logistics service centre, main types, range of services provided, impact on the environment.
12. Criteria for the choice of location of logistics service centres, domestic deployment and development options.
13. Definitions, types of industrial parks, their development, services.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4
2. Klingebiel, K., Wagenitz, A. (2013). An Introduction to Logistics as a Service. In: Clausen, U., ten Hompel, M., Klumpp, M. (eds) Efficiency and Logistics. Lecture Notes in Logistics. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-32838-1_22
3. Davis, F. W., & Manrodt, K. B. (1991). Service Logistics: An Introduction. International Journal of Physical Distribution & Logistics Management, 21(7), 4–13. https://doi.org/10.1108/eum0000000000393

Suggested readings:

1. Bányai, T., Bányai, Á., Kaczmar, I. Supply Chain - Recent Advances and New Perspectives in the Industry 4.0 Era. London, Egyesült Királyság / Anglia : IntechOpen (2022) , 226 p. ISBN: 9781803553733
2. Bányai, T., Petrillo, A., De Felice, F. Industry 4.0 - Impact on Intelligent Logistics and Manufacturing. London, Egyesült Királyság / Anglia : IntechOpen (2020) ISBN: 9781789854534

Subject name: **Reverse Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Ágota Bányainé Tóth,** associate professor, PhD	
Co-Lecturer(s): Dr. Péter Veres, senior lecturer, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 0**	**Requirement type: term mark**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to the "circular economy" model, the EU and national harmonised legislative background and recommendations that define its development. The course will cover the typical solutions of logistic systems related to the processing and recycling of hazardous substances, municipal waste and spent consumer durables, as well as the legal and economic methods that operate the system, in addition to the technical solutions.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

1. The concept of reverse logistics, its application to internal processes and external logistics systems.
2. The model of the "circular economy", characteristics and technical solutions of the logistics sub-processes, specificities of the management of different types of waste.
3. Design of collection systems, fixed and mobile logistics systems, presentation of landfill problems.
4. Logistics systems for reverse (specialised transport and loading equipment).
5. Waste storage technologies.
6. Used product processing systems, loading and dispatch scheduling issues, production scheduling issues.
7. Disassembly technologies of used products, e-market solutions, optimisation of disassembly strategies.

8. IT background of reverse logistics systems, application issues of modern product identification procedures.
9. Linkage to corporate management systems.
10. Life cycle analysis methodology.
11. Validation of the cleaner technologies concept in specific technologies and service systems.
12. Environmental safety issues, ISO 14000 regulation methodology.
13. Recycling oriented design approach.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Tchobanoglous, G., Kreith, F.: Handbook of solid waste management, McGraw-Hill, 2002, ISBN: 9780071356237
2. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.

Suggested readings:

1. Lund, H. F.: Recycling Handbook, McGraw-Hill, 2001, ISBN 0070391564
2. Bányai, T., Kaczmar, I.: Green Supply Chain: Competitiveness and Sustainability. London, Egyesült Királyság / Anglia : IntechOpen (2021) ISBN: 9781839683015

Subject name: **International Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Péter Veres**, senior lecturer, PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

During the course, students are introduced to the basic concepts of international logistics, with transport systems through countries and continents, multimodal system and shipping companies with their inner and outer tasks.

Knowledge:

- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know organisational, management and communication techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can organise, manage and control the operation of logistics systems.
- They can apply the acquired IT knowledge in solving the tasks arising in transportation and shipment.
- They can communicate professionally in their mother tongue and in at least one foreign language both orally and in writing in a professionally adequate manner.
- They take decisions in situations requiring a complex approach and unexpected decision-making by taking full account of legal and ethical standards.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

Basics and types of International Logistics. Conceptual system of international transportation -with 3rd and 4th parties. Types and paricipants of supply chains. International shipping laws and regulations. International shipping planning. Cost implications of international shipping.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Ann M. Brewer, Kenneth J. Button, David A. Hensher: Handbook of Logistics and Supply-Chain Management: Volume 2, ISBN:978-0-0804-3593-0, 2008
2. James H. Bookbinder: Handbook of Global Logistics Transportation in International Supply Chains, ISBN: 978-1-4419-6132-7, 2013
3. Rolf Neise: Container Logistics, ISBN: 0749481242 Kogan Page Ltd, 2018

Suggested readings:

Subject name: **International Trade**	**Neptun code:**
Responsible Lecturer: **Dr. Hajdú Noémi**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 7. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 0**	**Requirement type: exam**
Credits: 2	**Program:** Full time

Objective and purpose of the subject:

Aim of the course is to ensure that the participants actively practice the English language while expanding their professional knowledge. During the semester, students can learn the casual relationships that can be explored in international trade. Practice will be supported with actual case studies and articles.

Knowledge:

- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

Introduction to International Trade
Theoretical Overview
Trends and Key Players: SMEs and multis
The Political, Legal, Economic, Technological and Sociocultural Environment
Trade processes, Rules,
Trade political instruments, Customs,
Top Trading Countries – EUROPE, EU Statistics
Globalization, Regionalisation: BRICS
Global Market Places in the World I.: North and South America, Middle East, Africa
Global Market Places in the World II.: Eastern, Western and Central Europe, Asia
Top Trading Countries – USMCA
Top Trading Countries - CHINA
BREXIT
Case study

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Giffin, R. W. – Pustay, M. (2020): International Business: A Managerial Perspective. Pearson
2. Daniels, J. D. – Radebaugh, L. H. – Sulivan, D. P. – Click, R. W. (2022): Isternational Business, Pearson
3. Hill, C. (2021): ISE International Business: Competing in the Global Marketplace. McGraw-Hill
4. Cateora et. al: International Marketing. McGraw-Hill, 2015 https://docs.google.com/file/d/0B85wBQKZ1oaReGl1NEJXT2lYNlU/edit
5. Khan, M. – Hajdú, N. (2022): Analysis of International Trade Relation Regarding India and the European Union. International Journal of Business and Applied Social Science 8 : 5 pp. 26-35. , 10 p. (2022)

Suggested readings:

Subject name: **Integrated Enterprise Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Samad Dadvandipour**, associate professor PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements:**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The subject is the industry tenure used to define a comprehensive set of activities supported by the multi-module application software that helps a manufacturer or other significant issues of its business. These include production planning, paying for or acquiring parts /spare parts, maintaining stocks, cooperating with suppliers, making customer services available, and following orders. ERP can also include application modules for a business's finance and human resources aspects. Some of the ERP subcontracting markets are J. D.Edwards, System Application and Production (SAP), People soft, as well as IBM, Microsoft, and Oracle.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.

Skills:

- They can analyse at a basic level the disciplines which make up the knowledge system of the technical field, formulate interrelationships synthetically and carry out adequate assessment activities.
- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can connect sub-processes of logistics systems and the sub-units carrying out their functions (material handling equipment, sensors, actuators, control systems, database systems, etc.).
- They can detect errors in the logistics process and select remedial actions.

Attitude:

- They take responsibility and credibly represent the social aspects of the profession and its fundamental relation to the world.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.
- They are committed to broad-based enforcement of health and environmental protection.

Autonomy and responsibility:

- They make independent and professionally well-founded decisions even in unexpected decision-making situations.
- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- They are aware of the legal, economic, safety, social, health protection and environmental consequences of their work and decisions.

Subject description:

Enterprise Resource Planning (ERP) is a technique to integrate the data and processes of a business organization or company into a single system. ERP systems have many components, including hardware and software, to achieve integration. However, the majority of ERP systems use an incorporated database to store data for various functions found in organizations.

Assignment and requirements of signature:
Thematic presentation, Theme development

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Alexi Leon.: Enterprise Resource Planning – Publishing by McGraw Hill Publishing Company Limited, Copyright 2008, Alexi Leon. ISBN(13) 978-0-07-065680-2.
2. Khalid Sheikh, .: Manufacturing Resource Planning (MRP II), "Introduction to ERP, SCM, and CRM," by Publisher: McGraw-Hill. ISBN-13: 978-0071392303 ISBN-10: 0071392300
3. The Impact of Enterprise Systems on Corporate Performance: A study of ERP, SCM, and CRM System Implementations [An article from Journal of Operations Management] by K.B. Hendricks; V.R. Singhal; and J.K. Stratman, Publisher: Elsevier
4. ERP and Supply Chain Management by Christian N. Madu, Publisher: CHI- ISBN-13 : 978-0967602349
5. Implementing SAP ERP Sales & Distribution by Glynn C. Williams, Publisher McGraw-Hill: ISBN-13: 978-0071497053

Suggested readings:

1. Claus Ibsen: Camel in action, Manning Publications, ISBN-10: 1935182366, p. 552, 2011.
2. G. Hohpe, B. Woolf: Enterprise Integration Patterns: Designing, Building, and Deploying Messaging Solutions. Addison-Wesley Professional, ISBN: 0321200683, 2003.
3. D. S. Linthicum: Enterprise Application Integration. Addison Wesley, ISBN: 0201615835, 1999.

Subject name: **Service Logistics Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Róbert Skapinyecz**, associate professor, PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

During the course, students are introduced to the models of service logistics systems and the aspects that determine their design. Within the scope of the subject, supply chain solutions related to service activities, first-mile and last-mile processes, logistical aspects of services supporting recycling activities, typical solutions of urban logistics systems, logistical aspects of service-related maintenance and quality management activities related to production activities are presented.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Supply chain solutions in various areas of services. City logistics solutions in settlements of different sizes. First-mile logistics. Last-mile logistics. Typical systems of recycling logistics service. Logistics aspects of quality management. Maintenance logistics. Application of Industry 4.0 technologies in service systems.

Assignment and requirements of signature:

thematic tests and semester assignment

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Hans-Christian Pfohl: Logistics Systems, Business Fundamentals, ISBN: 978-3-662-64349-5, Springer 2022
2. Gianpaolo Ghiani, Gilbert Laporte, Roberto Musmanno: Introduction to logistics systems management. Wiley 2013, ISBN: 978-1-119-94338-9

Suggested readings:

1. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.
2. Bányai, T., Kaczmar, I.: Green Supply Chain: Competitiveness and Sustainability. London, Egyesült Királyság / Anglia : IntechOpen (2021) ISBN: 9781839683015

Subject name: **Planning of Logistics Services**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás,** head of institute, full professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Róbert Skapinyecz, associate professor, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Service Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The course introduces the planning tasks and methods related to logistics services.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can connect sub-processes of logistics systems and the sub-units carrying out their functions (material handling equipment, sensors, actuators, control systems, database systems, etc.).
- They can apply the acquired IT knowledge in solving the tasks arising in transportation and shipment.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They share their experience with colleagues to help them grow.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- They evaluate the efficiency, effectiveness and safety of their subordinates' work.

Subject description:

Introducing logistics services. Guidelines and steps for planning logistics services. Application of process improvement methods to logistics services. Application of simulation test methods to logistics services. Process of implementation of logistics services after design. Evaluation and condition monitoring of logistics services.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Rushton, A., Croucer, P., Baker, P.: The handbook of logistics and distribution management, 3rd edition, Kogan Page Limited, ISBN 9780749446697, 2006.
2. James M. Apple: Plant layout and material handling, John Wiley & Sons, ISBN 0471-07171-4
3. Bartholdi, J. J., Hackman, S. T.: Warehouse & Distribution Science, Release 0.85, www.warehouse-science.com

Suggested readings:

1. Tamás, P.: Innovative simulation testing methods in logistics: Miskolc, 2021., ISBN: 978-963-358-239-8
2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4

Subject name: **Maintenance Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Péter Telek,** associate professor, PhD	
Co-Lecturer(s): Dr. Ákos Cservenák, senior lecturer, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Technical Logistics**
Classes per week: **Theoretical:** 2 **Practical: 1**	**Requirement type: term mark**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

Main objective of the course is to present the logistics integrated maintenance management activities for the students. During the semester, the typical production systems and their maintenance aspects, and the integrated scheduling of the maintenance and logistic tasks are presented

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can organise, manage and control the operation of logistics systems.
- They can perform basic engineering tasks related to the design, production, repair and organisation of certain components of logistics systems.
- They can apply integrated knowledge from the field of transportation, mobile machines, process theory, industrial production processes, as well as electronics and informatics.
- They can detect errors in the logistics process and select remedial actions.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Main topics of the course: Principles of the maintenance processes and methods. Material and information flow of maintenance processes. Logistic tasks and parameters related to the maintenance process. Maintenance networks and their logistic aspects. Recycling aspects of the maintenance activities. Control and identification in maintenance systems. Reliability of handling machines. Stock management in maintenance systems. Optimisation and lean in the maintenance process. Project oriented maintenance.

Assignment and requirements of signature:
thematic tests

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Venkatesh, J.: An Introduction to Total Productive Maintenance (TPM). 2007. https://www.academia.edu/36412225/ An_Introduction_to_Total_Productive_Maintenance_TPM

Suggested readings:

1. Bloch, H. P., Geitner, F. K.: Machinery Component Maintenance and Repair. Elsevier, 2005.

Subject name: **Warehouse Logistics**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Tamás Bányai,** professor, PhD, dr. habil	
Co-Lecturer(s): Dr. Péter Veres, senior lecturer, PhD	
Suggested semester: 7. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to warehousing services, the tools of warehousing services and their impact on the efficiency of service activities. Students will learn the typical warehousing service strategies to ensure efficient production and service delivery through warehousing services. The course provides a level of knowledge that will also form the basis for the MSc in Logistics

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.
- They know computer communication, major software applications in the field.
- They know organisational, management and communication techniques.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

1. Inventories in production and services.
2. Classification and characterisation of warehouse services.
3. Warehousing services in logistics centres.
4. Consignment warehousing as a service.
5. Characterisation of crossdocking warehousing services.
6. Description of warehousing tools, with particular reference to their impact on service quality.

7. Stocking strategies for independent demands. EOQ.
8. Stocking strategies for dependent demands. MRP.
9. Models for determining optimal order lot sizes.
10. Determination of production material requirements for a warehouse with service activities.
11. Management process for warehousing services.
12. Characterisation of warehousing services in global supply chains.
13. Application of Industry 4.0 technologies to increase the efficiency of warehousing services.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4
2. Wayne L. Winston: Operations research – applications and algorithms, ISBN 0-534-38058-1

Suggested readings:

1. David Simci-Levi, Xin Chen, Julien Bramel: The logic of logistics, Springer, ISBN 0-387-22199-9
2. James M. Apple: Plant layout and material handling, John Wiley & Sons, ISBN 0471-07171-4

Subject name: **Optimization of Logistics Processes**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Tamás Bányai,** professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Péter Veres, senior lecturer, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 6	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to the main design tasks of logistics systems. The course will introduce the main design methods of logistics systems. The aim is to provide the theoretical basis for the optimal design of logistics systems and to introduce the design principles, which can be further developed in the Master's degree.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.

Subject description:

1. Basics of logistics systems.
2. Description of logistcis problems with functions, graphs and matrixes.
3. Design tasks and methods for purchasing.
4. Design tasks and methods for production.
5. Design tasks and methods for distribution.
6. Design tasks and methods for recycling.
7. Analytical methods.
8. Linear programming.
9. Heuristic design methods (genetic algorithm).
10. Heuristic design methods (ant colony).
11. Heuristic design methods (harmony search).
12. Basics of large-scale systems design.
13. Numerical examples.

Assignment and requirements of signature:
Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4 2. Wayne L. Winston: Operations research – applications and algorithms, ISBN 0-534-38058-1
Suggested readings: 1. James M. Apple: Plant layout and material handling, John Wiley & Sons, ISBN 0471-07171-4 2. David Simci-Levi, Xin Chen, Julien Bramel: The logic of logistics, Springer, ISBN 0-387-22199-9

Subject name: **Logistics Projects**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás,** head of institute and full professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Ákos Cservenák, senior lecturer, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Service Logistics Systems**
Classes per week: **Theoretical:** 0 **Practical: 1**	**Requirement type: term mark**
Credits: 2	**Program:** Full time

Objective and purpose of the subject:

During the course, students are introduced to the typical objectives and structure of complex logistics projects, the engineering tasks to be performed in each project phase, through real-life development examples. In the course, students will be required to develop a concrete practical project using the knowledge acquired in the various logistics subjects in a complex way under the professional guidance of an institute/industry consultant. This will enable the student to practice the steps and methods of independent engineering work, which will equip him/her with the skills of practical problem identification, exploration and analysis in the field of logistics.

Knowledge:

- They have comprehensive knowledge of the basic facts, directions and boundaries of logistics.
- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know the learning, knowledge acquisition, data collection methods of logistics, their ethical limitations and problem-solving techniques.

Skills:

- They can apply the principles and methods of calculation and modelling of logistical processes.
- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can detect errors in the logistics process and select remedial actions.
- They can plan, organise and carry out independent learning.
- They can understand and use the literature, computer technology and library resources of logistics.
- They can communicate professionally in their mother tongue and in at least one foreign language both orally and in writing in a professionally adequate manner.

Attitude:

- They take responsibility and represent the values of the engineering profession and openly accept well-founded critical comments.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to ensure that their self-directed learning in the field of logistics is continuous and consistent with their professional goals.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.

Subject description:

Within the framework of the course, students get acquainted with various logistics projects implemented in practice and their main characteristics through lectures by lecturers and invited industry experts. Using this knowledge, the students get the task of presenting in detail the entire logistics system of a base company, either chosen by themselves or by the Institute, covering the processes of the individual logistics subsystems, the implementation, tools, and organization of the flow of materials and information in these subsystems. Evaluate the system presented from a logistical point of view and identify problems independently. Under the professional guidance of the institute supervisor and the institute/industry consultant, further analysis of selected problems in a given sub-area, exploration of cause-and-effect relationships through the complex application of previously acquired knowledge. Formulation of a generous improvement concept to remedy the problems identified. Use manual and computer-assisted techniques to develop the task. The independent preparation of the end-of-semester written submission or presentation is supervised or assisted by the institute supervisor and the institute/industry consultant, with the related tasks being coordinated by the subject supervisor

Assignment and requirements of signature:

The condition for obtaining a signature and a successful term mark is the preparation and submission of the end-of-semester "Logistics project" application that meets the content and form requirements, as well as its presentation before the institute committee.

Requirement end evaluation of the practical mark/ exam:

The condition for obtaining a signature and a successful term mark is the preparation and submission of the end-of-semester "Logistics project" application that meets the content and form requirements, as well as its presentation before the institute committee.

Required readings:

1. Tamás, P.: Innovative simulation testing methods in logistics: Miskolc, 2021., ISBN: 978-963-358-239-8
2. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4
3. Rushton, A., Croucer, P., Baker, P.: The handbook of logistics and distribution management, 3rd edition, Kogan Page Limited, ISBN 9780749446697, 2006.

Suggested readings:

1. Pedro García Márquez, F.; Segovia R. I.; Bányai, T., Tamás, P.: Lean Manufacturing and Six Sigma – Behind the Mask: London, Egyesült Királyság/Anglia: InTech Open Access Publisher, 2021.
2. Langford, J.: Logistics principles and applications, Sole Press, ISBN-10: 0-07-147224-X, 2007.

Subject name: **Production Logistics Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Péter Veres**, senior lecturer, PhD	
Co-Lecturer(s):	
Suggested semester: 5. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

During the course, students are introduced to the role and content of the production logistics systems. Students will gain an overview of typical production philosophies, strategies, supporting manufacturing and assembly systems, and basic inventory concepts and methods.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment.
- They know organisational, management and communication techniques.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can apply integrated knowledge from the field of transportation, mobile machines, process theory, industrial production processes, as well as electronics and informatics
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

The process, tasks and strategies of production logistics. The method and modules of the planning of the production logistics system. Supply chain management. Characteristics of a push-pull production philosophy. Basic pillars and characteristics of JIT production. Application of Kanban philosophy. The foundations, building blocks and tools of Lean philosophy. Presentation of typical production systems. Presentation of typical installation systems. Basics of inventory management and buffers.

Assignment and requirements of signature:

Requirement end evaluation of the practical mark/ exam:

Required readings:

1. Fausto P. G. M.: Lean Manufacturing and Six Sigma - Behind the Mask, Published by IntechOpen, ISBN 978-1-78923-908-9, 2020.
2. Peter N., Hans-Peter W.: Fundamentals of Production Logistics: Theory, Tools and Applications: DOI: 10.1007/978-3-540-34211-3, ISBN: 978-3-540-34210-6, 2008

Suggested readings:

1. Bandyopadhyay A. K.: 5 Case Study Ideas In Production, Operation, Supply Chain And Logistics Management: With Questions and Suggested Answers, Orangebooks Publication, ISBN: 9789356210295, 2022

Subject name: **Design of Production Logistics Systems**	**Neptun code:**
Responsible Lecturer: **Dr. Tamás Bányai**, professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Péter Veres, senior lecturer, PhD	
Suggested semester: 6. semester	**Preliminary requirements: Production Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 5	**Program:** Full time

Objective and purpose of the subject:

The course introduces students to the main design tasks of production logistics systems. The course will introduce the main design methods of production logistics systems in terms of installation and layout planning, route planning, unit load planning, mass handling systems.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs
- They know the basics, boundaries and requirements of logistics, management, environmental protection, quality assurance, information technology, law and economics closely related to transportation and shipment

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- - Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

1. Methods to describe material flow tasks in logistics processes.
2. Typical models and solution methods for deployment tasks in production processes.
3. Facility location problems.
4. Centre search tasks.
5. In-plant supply design.
6. Routing problems in production.
7. Inventories in production.
8. Models and methods of flow planning in production processes.
9. Application of queuing models in production processes.
10. Application of newsagent models.
11. Reliability of production systems.
12. MRP in production.
13. ERP systems and production logistics.

Assignment and requirements of signature:
Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4 2. Wayne L. Winston: Operations research – applications and algorithms, ISBN 0-534-38058-1
Suggested readings: 1. James M. Apple: Plant layout and material handling, John Wiley & Sons, ISBN 0471-07171-4 2. David Simci-Levi, Xin Chen, Julien Bramel: The logic of logistics, Springer, ISBN 0-387-22199-9

Subject name: **Warehousing Processes and Inventory Management**	**Neptun code:**
Responsible Lecturer: **Prof. Dr. Péter Tamás,** head of institute and full professor, PhD, dr. habil.	
Co-Lecturer(s): Dr. Péter Veres, senior lecturer, PhD	
Suggested semester: 7. semester	**Preliminary requirements: Logistics Systems**
Classes per week: **Theoretical:** 2 **Practical: 2**	**Requirement type: exam**
Credits: 4	**Program:** Full time

Objective and purpose of the subject:

The course introduces the warehousing systems and methods, the characteristics of warehouse storage and loading equipment and their typical applications. Students learn typical warehouse strategies, warehouse activities and their indicators of efficiency and how to operate efficiently. Providing a level of knowledge that will also form the basis for the MSc in Logistics.

Knowledge:

- They know logistics processes, the ways in which they are carried out and their technical possibilities.
- They know the methods, implementation possibilities and practices of assessing basic logistics needs.
- They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.
- They know computer communication, major software applications in the field.
- They know organisational, management and communication techniques.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can recognise the transportation, shipment and material handling processes in industrial production and economic systems, and the equipment requirements for logistics implementation.
- They can organise, manage and control the operation of logistics systems.
- They can use their knowledge in a creative way to effectively manage the resources of the workplace.

Attitude:

- They monitor legislative, technical, technological and administrative changes related to logistics.
- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.
- They strive to solve problems and make management decisions by getting to know the opinions of the employees they manage, preferably in cooperation with them.

Autonomy and responsibility:

- They cooperate responsibly with qualified professionals of other (primarily economic and legal) disciplines during their professional duties.
- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Structure of warehouse systems. Types of rack and rackless storage, their characteristics, and applications. Types of automated storage systems, their characteristics, and applications. Types and characteristics of ULDs (Unit Load Device) for different storage systems. Structure of warehouse service systems. Introduction to the characteristics of manual or hand-operated and automated storage and retrieval systems. Management strategies and information systems for warehouse systems. Types and characteristics of other services related to warehouse activities (order picking, creating unit load, packaging). Structure of

warehousing costs. Indicators of efficiency of warehousing activities. Methodology for planning warehouse structure. Description of typical warehouse stock control systems.
Assignment and requirements of signature:
Requirement end evaluation of the practical mark/ exam:
Required readings: 1. Rushton, A., Croucer, P., Baker, P.: The handbook of logistics and distribution management, 3rd edition, Kogan Page Limited, ISBN 9780749446697, 2006 2. Bartholdi, J. J., Hackman, S. T.: Warehouse & Distribution Science, Release 0.85, www.warehouse-science.com
Suggested readings: 1. Bányai, T.: Design of Material flow systems. 2021. ISBN 978-963-358-237-4 2. 2. Klingebiel, K., Wagenitz, A. (2013). An Introduction to Logistics as a Service. In: Clausen, U., ten Hompel, M., Klumpp, M. (eds) Efficiency and Logistics. Lecture Notes in Logistics. Springer, Berlin, Heidelberg. https://doi.org/10.1007/978-3-642-32838-1_22

Subject name: **Mechatronics in Logistics**	**Neptun code:**
Responsible Lecturer: **Dr. Ákos Cservenák**, senior lecturer, PhD	
Co-Lecturer(s):	
Suggested semester: 6. semester	**Preliminary requirements: Material Handling Machines**
Classes per week: **Theoretical:** 2 **Practical: 1**	**Requirement type: term mark**
Credits: 3	**Program:** Full time

Objective and purpose of the subject:

The course introduces to the concepts of automation and mechatronics and the functions, design and operation of mechatronic devices used in intelligent material handling machines and material flow systems.

Knowledge:

- They know the principles of operation and structural characteristics of vehicles and machinery systems suitable for logistics processes.
- They know the operation and maintenance systems of vehicles and mobile machinery used in logistics processes.
- They know the measurement procedures used in logistics, their tools, instruments and measuring equipment.
- They know organisational, management and communication techniques.

Skills:

- They can interpret and characterise the elements of logistics processes, their interrelationships, roles and importance in the overall process.
- They can organise, manage and control the operation of logistics systems.
- They can apply integrated knowledge from the field of transportation, mobile machines, process theory, industrial production processes, as well as electronics and informatics.
- They can connect sub-processes of logistics systems and the sub-units carrying out their functions (material handling equipment, sensors, actuators, control systems, database systems, etc.).

Attitude:

- They are open to know, accept and credibly communicate professional and technological development and innovation in logistics.

Autonomy and responsibility:

- They identify gaps in the technologies used, the risks of the processes and initiate action to reduce them.
- Under the guidance of their line manager, they manage the work of the staff assigned to them, supervise the operation of processes and vehicles.

Subject description:

Basics, main types and characteristics of material flow systems. Definition of automatics, automation, mechatronics. Types and main characteristics of automated material handling equipment and intelligent machines. The role of mechatronics in the development of automated material flow systems. The framework of the Industry 4.0 concept and the main related technologies. Sensor technology, types and functional characteristics of sensors and their application in material flow. Types and characteristics of actuators. Robot, robotics, concept of robotization, typical robot types. Characteristics of industrial and mobile robots: structure, movement modes, coordinate systems, operational characteristics. Design and characteristics of robotic workplaces.

Assignment and requirements of signature:

The condition for obtaining a signature and a successful practical certificate is to achieve at least 50% of the maximum score that can be obtained for the end-of-semester closed paper and to attend at least 60% of the classes held during the semester (HKR § 50 (5)).

Requirement end evaluation of the practical mark/ exam:

The condition for obtaining a signature and a successful practical certificate is to achieve at least 50% of the maximum score that can be obtained for the end-of-semester closed paper and to attend at least 60% of the classes held during the semester (HKR § 50 (5)).

Required readings:

1. Habib, M.K.: Handbook of research on advanced mechatronic systems and intelligent robotics, Handbook of Research on Advanced Mechatronic Systems and Intelligent Robotics, 2019. p. 466.
2. Robert H. Bishop: The Mechatronics Handbook, CRC Press, Boca Raton-London-New York-Washington, D.C., 2002.

Suggested readings:

1. Hans-Peter Schöner: Automotive mechatronics, Control Engineering Practice, Volume 12, Issue 11, ISSN 0967-0661, 2004. p. 1343-1351.