COURSE DESCRIPTION CARD - SYLLABUS

Course name
Transportation Systems [S2Log2-MPTS>ST]

Course

Field of study
Logistics

Year/Semester
1/2

Area of study (specialization)
Manager of a Transport and Forwarding Company

Profile of study
general academic

Level of study
second-cycle

Course offered in
Polish

Form of study
full-time

Requirements
elective

Number of hours

Lecture
30

Laboratory classes
0

Other (e.g. online)
0

Tutorials
30

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Student has a basic background in transportation, logistics and management. He/ she can carry out analytical tasks and apply basic management tools and methods in transportation and logistics. He/ she is able to perform a team work.

Course objective

To familiarize students with the basic concepts and terms associated with transportation and transportation systems. Present operating rules of Transportation Systems and data describing their operations.

Course-related learning outcomes

Knowledge:
1. Student knows dependencies in the area of transportation systems and their relations with logistics [P7S_WG_01]
2. Student knows extended issues in the field of mathematics and optimization methods in studying the structure of economic and logistic phenomena within transportation systems [P7S_WG_04]
3. Student knows extended issues in the scope of management characteristic for transportation systems [P7S_WG_08]

Skills:
1. Student can make a critical analysis of technical solutions used in the analyzed transportation system (in particular with regard to devices, objects and processes) [P7S_UW_04]
2. Student can assess the suitability and the possibility of using new achievements (techniques and technologies) in the field of transportation systems and functionally related areas [P7S_UW_06]
3. Student can formulate and solve tasks through interdisciplinary integration of knowledge from different fields and disciplines used to design transportation systems [P7S_UO_01]

Social competences:
1. Student can recognize causal relationships in achieving the set goals and grading the significance of alternative or competitive tasks within transportation systems [P7S_KK_01]
2. Student can identify correctly and resolve dilemmas related to the profession of logistic manager in the area of transportation systems, with respect for professional ethics and diversity of views and cultures [P7S_KK_02].
3. Student can plan and manage in a creative way business ventures within transportation systems [P7S_KO_01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Formative assessment: homeworks, discussions summarizing individual lectures, giving the student the opportunity to assess the understanding of the problem, active participation in lectures. Final assessment: 45 minute, written exam in the subject , test composed of 25 questions (closed and open); satisfactory threshold - 50%.
Tutorial: Formative assessment: evaluation of homeworks/assignements, active participation in case discussions, evaluation of students' analytical skills. Final assessment: 30 minute, written test in the subject ; the test composed of 20 questions (closed and open); satisfactory threshold - 50%.

Programme content

Definition and basic characteristics of transportation systems along with their classification. Description of major components of of transportation systems: infrastructure, fleet, people - crews, regulations/ rules, information flow. Design of transportation systems and solving selected decision problems in these systems.

Course topics

Lecture: Introduction to the topic. The definition of transportation and transportation systems. and transportation systems management. Basic characteristics and operating rules of Transportation Systems. Content of the c ourse/ lecture. Major components of Transportation Systems and their description. Classification of Transportation Systems. Single-mode and multimodal Transportation Systems. System Approach for Transportation Systems Analysis. Transportation System as an object. Passengers' vs. Freight Transportation Systems. Description, basic features and existing interactions between basic elements of Transportation Systems: Infrastructure, Fleeet, People (Crew), Rules/ Regulations, Processes. Presentation of different infrastructural solutions in Transportation Systems. Linear and Point infrastructure. Analysis of road-, railway-, sea- and air- transportation infrastructure. Characteristics of different categories of fleet operating in Transportation Systems. Analysis of fleet operating in road-, railway-, sea- and air- Transportation Systems. Description of crews serving Transportation Systems and rules/ regulations controling the operations of Transportation Systems. Analysis concerning road-, railway-, sea- and air- Transportation Systems. Basic processes (business and technological) carried out in Transportation Systems. Process analysis of selected transportation processes. Comparative characteristics of Transportation Systems. Analysis of statistical data. Review of road-, railway-, sea- and air- Transportation Systems. Selected examples of Transportation Systems around the World. Major decision problems arising in Transportation Systems - their features and solution procedures. Classification of transportation decision problems. Major decision problems arising in Transportation Systems - their features and solution procedures. Classification of transportation decision problems. Solving selected categories of decision/ management problems arising in Transportation Systems: network design, location analysis, fleet composition, crew assignment and scheduling, customer service. Principles of Transportation System design, evaluation and management.

Desription of the available tools and methods (e.g. Visum, Vissim, Multiple Criteria methods, Cost-Benefit methods). Stages of Transportation System design/development: analysis of transportation demand, design of a transportation network, traffic assignment, definition of transportation modes (types of vehicles), allocation of crews. The principles of a 4-stage model. Required elements associated with Transportation Systems' planning, design and development: land use desgn, infrastructure development, implementation of management rules, information provision, design of pricing strategies. Intelligent Transportation Systems (ITS). Basic concepts and features. Selected examples of ITS-s world wide. Case study analysis.
Tutorial: Analysis of major characteristics of different transportation modes/ industries. Evaluation of sea-, air-, railway- and road- transportation systems. Computation of such parameters as: safety, costs, travel/ delivery time, environmental friedliness, comfort of travelling/ customer service. Single- amd multiple criteria ranking of different transportation mode/ industries. Design and evaluation of transportation systems. Analysis of uni-modal and multi-modal solutions. Development of transportation movements/ connections of selcted routes (origins - destinations). Simulation of generated results. Assessment of Transportation Systems components. Analysis of crews'/ employees' qualifications and skills and characteristics of vehicles in different transportation systems. Assignemnt of employees/ vehicles to transportation jobs in different transportation systems. Assessment of Transportation Systems components - continuation. Multiple criteria ranking of fleet/ vehicles in different transportation systems and comparative analysis and multiple criteria evaluation of transportation infrastructure (e.g. road/ railway networks) in different transportation systems. Analysis for different countries. Analysis and redesign of selected transportation systems. Identification and eimination of "bottle necks". Imorovement of process efficiency and effectiveness. Cost reduction. Increase of the throuput - transportation capacity. Multiple criteria evaluation of Transportation Systems. Definition of evaluation criteria. Modeling of preferences. Computational experiments. Ranking of Transportation Systems. Analysis of and solving selected categories of decision/ management problems arising in Transportation Systems. Network design - application of maximum flow algorithm, shortest path algorithm and transportation method. Optimal fleet composition to perform specific transportation jobs. Traffic simulation. Application of a 4-stage model for a selecyed case study. Demand analysis - definition of the O-D matrix; design of a transportation network, traffic assignment to the network. Application of traffic simulation tools - Visum/ Vissim. Review and Evaluation of selected solutions for Intelligent Transportation Systems (ITS). Ranking of ITS-s in selected countries.

Teaching methods

Lecture: conversatory lecture, interactive speech, case studies, problem oriented discussion.
Tutorial: analytical and computational methods.

Bibliography

Basic:
1. Wojewódzka-Król K., Załoga E., Transport. Tendencje zmian, Wydawnictwo Naukowe PWN, Warszawa, 2022.
2. Bierlaire M. (Eds.), Integrated Transport and Land Use Modeling for Sustainable Cities, Routledge, New York, 2014.
3. Daganzo C., Fundamentals of Transportation and Traffic Operations, Pergamon Press, New York, 1997.
4. Wojewódzka-Król K., Rolbiecki R., Infrastruktura transportu, Wydawnictwo Naukowe PWN, Warszawa 2018.

Additional:
1. Tumlin J., Sustainable Transportation Planning. Tools for Creating Vibrant, Healthy, and Resilient Communities, Wiley, San Francisco - Toronto, 2012.
2. Żak J., Hadas Y., Rossi R. (Eds.), Advanced Concepts, Methodologies and Technologies for Transportation and Logistics, Springer, Heidelberg, 2018.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	60	2,50
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	40	1,50