COURSE DESCRIPTION CARD - SYLLABUS

Course name
Location analysis for logistics systems [S2Log2E-SL>ALwSL]

Course

Field of study
Logistics

Year/Semester
2/3

Area of study (specialization)
Logistics Systems

Profile of study
general academic

Level of study
second-cycle

Course offered in
english

Form of study
full-time

Requirements
elective

Number of hours

Lecture
15

Laboratory classes
0

Other (e.g. online)
0

Tutorials
15

Projects/seminars
15

Number of credit points

3,00

Coordinators

dr hab. inż. Jacek Żak prof. PP
jacek.zak@put.poznan.pl

Lecturers

Prerequisites

Student has a basic background in logistics, management and operations research. He can carry out analytical tasks and manage projects as well as apply basic quantitative tools and methods. He is able to perform a team work.

Course objective

To familiarize students with the basic concepts and terms associated with location analysis in logistics. Presentation of rules and tools/ methods allowing to define a desirable location of logistics objects (point infrastructue) as well as principal decision models leading to the definition of the optimal location of warehouses, distribution centers, terminal, etc.

Course-related learning outcomes

Knowledge:
1. Student knows issues in the field of location analysis for logistics systems [P7S_WG_02]
2. Student knows issues of process mapping, process orientation and process simulation within location analysis for logistics systems [P7S_WG_03]
3. Student knows extended concepts for location analysis for logistics systems [P7S_WG_05]

4. Student knows extended issues in the field of management characteristic for location analysis for logistics systems [P7S_WG_08]
5. Student knows the detailed methods, tools and techniques characteristic of location analysis for logistics systems in logistics [P7S_WK_01]
6. Student knows best practices within location analysis for logistics systems [P7S_WK_04]

Skills:
1. Student can make a critical analysis of technical solutions used in the analyzed logistics system (in particular with regard to devices, objects and processes) within location analysis [P7S_UW_04]
2. Student is able to design, using properly selected means, an experiment, analytical process or scientific research project/ program solving a problem within within location analysis for logistics systems [P7S_UK_01]
3. Student can identify changes in requirements, standards, regulations, technological development and behaviour of the labor market. Based on their recognition he/she is able to determine the needs to extend and enhance his/ her own and others' knowledge within location analysis for logistics systems [P7S_UU_01]

Social competences:
1. Student is responsible for his/ her own work and ready to comply with the rules of working in a team and taking responsibility for the tasks carried out jointly in the field of location analysis for logistics systems [P7S_KR_01]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Formative and final assessment: homeworks, discussions summarizing individual lectures, giving the student the opportunity to assess the understanding of the problem, active participation in lectures.
Tutorial: Formative assessment: assessment of the assignments, participation in case study discusssions, evaluation of students' analytical skills. Final assessment: 30 minute, written test in the subject composed of approx. 20 questions (open and closed); passing threshold - 50%.
Project: Formative assessment: assessment of class activities, active participation in classes. Final assessment: grading the project in the field of location analysis in logistics, evaluation of the student's skills in mathematical modeling of the location problem and his/ her ability to perform computational experiments.

Programme content

Lecture: Introduction to the topic. Definition of the location problem and presentation of basic terms. Examples of location problems in logistics, the essence of location selection for warehouses, distribution centers, passenger's and freight terminals, airports and sea ports. Content of the lecture and characteristics of the projects. Classification of logistics infrastructure (linear and point). Characteristics of point infrastructure in logistics systems: warehouses, distribution centers, passengers' and freight terminals, airports, sea ports, railway stations, border crossing points, transportation hubs, parkings. System Approach for Location Problem Analysis. Location of a technical object in a system. Logistics examples. Location problem in logistics systems at strategic, tactical and operational levels. Solving a location problem of logistics objects as a strategic planning problem. Major approaches to location analysis in logistics: expert-based (heuristic) planning combined with simulation; location selection with an application of optimization methods; hybrid (mixed) approach. Location analysis based on single- and multiple criteria approach. Location problem as a single- and multiple criteria optimization (mathematical programming) problem and/or multiple criteria ranking problem. Adaptation of different location decision models to a specific character of logistics systems. Case study analysis. Location selection for: logistics/ distribution centers, airports and airport terminals, parking lots, warehouses, passengers' and freight terminals, sea ports, railway stations, border crossing points, transportation hubs. Solving real life location probems in logistics systems within projects.
Tutorial: Practical analysis of selected location problems in logistics systems. Verbal description of certain location problems, e.g: airport location problem, supermarket location problem, distribution center location problem. Mathematical formulation of selected location problems. Different ways of location problems structuring. Examples of optimization oriented formulations and ranking oriented formulations; single objective and multiple objective location problems. Application of different tools for

solving the location problem. Analytical methods (center of gravity method, optimization methods (solver), decision - aiding methods (e.g. Electre, AHP). Computational exercises - different case studies. Finding a desired location of a logistics object: supermarket, distribution center, airport…. Comprehensive analysis of real life location problems.
Project: Introduction. Characteristics of the projects. Recognition and description of different logistics-oriented location problems. Selection of the topics for project considerations. Analysis and verbal description of a certain location problem. Thorough considerations of a concrete location problem, e.g. airport location problem, suoermarket location problem, distribution center location problem. Mathematical formulation of the logistics location problem. Application of the mathematical programming model (single objective; multiple objective) and/or ranking model (mutiple objective). Solving the logistics location problem. Application of optimization methods (solver) and/ or multiple criteria ranking methods. Finding the best location for a logistics object.

Teaching methods

Lecture: conversatory lecture; interactive discussion; case studies.
Tutorial: analytical and computational methods.
Project: project method; practical analysis of the decision problem; computational experiments.

Bibliography

Basic:
1. Eiselt H., Marianov V., Foundations of location analysis, Springer, Heidelberg, 2011.
2. Farahani R., Hekmatfar M. (Eds.), Facility Location: Concepts, Models, Algorithms and Case Studies, Physica-Verlag, Heidelberg, 2009.
3. Rushton A., Craucher P., Baker P., The Handbook of Logistics and Distribution Management, Kogan Page, London - Philadelphia, 2006.

Additional:
1. Daganzo C., Logistics System Analysis, Springer Verlag, Berlin, 1996.
2. Drezner Z., Hamacher H., Facility Location: Applications and Theory, Springer, Berlin, 2002.
3. Żak J., Węgliński S., The selection of the logistics center location based on MCDM/A methodology. Transportation Research Procedia, Vol. 3, 2014, s. 555-564.
4. Hillier F., Lieberman G., Introduction to Operations Research, McGraw Hill, Boston - New York - London, 2005.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,00
Classes requiring direct contact with the teacher	45	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	30	1,00