STUDY MODULE DESCRIPTION FORM

Name of the module/subject		Code
Computer Aided Logistics Processes		**1010631251010610401**
Field of study **Transport**	Profile of study (general academic, practical) **(brak)**	Year /Semester **3 / 5**
Elective path/specialty **Engineering of Pipeline Transport**	Subject offered in: **Polish**	Course (compulsory, elective) **obligatory**
Cycle of study: **First-cycle studies**	Form of study (full-time,part-time) **full-time**	
No. of hours Lecture: **1** Classes: **-** Laboratory: **1** Project/seminars: **-**		No. of credits **3**
Status of the course in the study program (Basic, major, other) **(brak)**	(university-wide, from another field) **(brak)**	
Education areas and fields of science and art **technical sciences**		ECTS distribution (number and %) **3 100%**

Responsible for subject / lecturer:

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Prerequisites in terms of knowledge, skills and social competencies:

1	**Knowledge**	Student has a general knowledge of the organization and functioning of the of transport companies, knows basic IT tools
2	**Skills**	Student is able to identify problems and suggest areas for decision-making tools, freely uses the office applications
3	**Social competencies**	Student is able to do a literature research and knows the rules of group work and discussion. Student is aware of the possibility of creating a competitive advantage through the use of modern IT applications.

Assumptions and objectives of the course:

Acquainting with modern computer systems (based on GIS technology) used for decision support in transportation companies at all levels of management. In the framework of the laboratory classes possibilities and methods of effective use of modern technologies in computer assisted solving of common transport problems will be demonstrated.

Study outcomes and reference to the educational results for a field of study

Knowledge:

1. Knows the advantages of Geographic Information Systems and the resulting possibilities for supporting the decision maker. - [K1A_W05]
2. Knows basic methods of modeling decision problems taking into account the GIS systems. - [K1A_W05]
3. Knows rules of automation of common logistic tasks using simple applications (spreadsheets). - [K1A_W06]
4. Knows the specificity of work and methodology of solving logistic tasks with a use of a given GIS system. - [K1A_W06]
5. Knows modern approaches to problem solving (evolutionary algorithms, artificial intelligence). - [K1A_W08]
6. Knows modern technologies used in transportation (computer networks, GPS, GSM). - [K1A_W10]

Skills:

1. Is able to solve simple decision-making problems using spreadsheet and optimization module. - [K1A_U01 K1A_U02]
2. Is able to model and solve decision-making problems using GIS systems. - [K1A_U13]
3. Is able to identify the optimal methods for solving chosen problems - [K1A_U16]
4. Is able to evaluate the quality of the results and carry out the validation with use of alternative methods. - [K1A_U17]
5. Is able to visualize the results of the optimization algorithms using GIS tools. - [K1A_U18]

Social competencies:

1. Is aware of the possibility of creating a competitive advantage through the use of modern IT applications. - [K1A_K01]
2. The high level of mastered techniques and tools helps interdisciplinary communication. - [K1A_K03]
3. Is able to independently develop his knowledge in the field of decision-making support systems. - [K1A_K04]

Assessment methods of study outcomes

Partial evaluation:

- assessment of the student activity during lectures
- individual assessment of the laboratory tasks.

Final evaluation:

- average rating taking into account assessment of the student activity during lectures and a written final test
- average rating taking into account student?s activity in the laboratory classes and partial grades.

Course description

1. Introduction to the problems of computer-aided logistics: formulation or the decision-making problem, the construction of a mathematical model, determining solutions, validation of solutions, decision making. The laboratory is provided for the implementation of a few simple tasks using a spreadsheet with optimization toolbox.

2. Introduction to GIS: Basic concepts, application areas, the development of modern Geographic Information Systems. Methodology for using GIS for solving optimization and decision-making problems. Example solution of chosen problem with and without the use of GIS will be conducted to indicate the advantages and disadvantages of both approaches.

3. GIS as an analytical tool: Basic concepts, methodology of application of Geographic Information Systems as an analytical tool. Sample analysis of the communication lines in selected city. Analysis of the effects of modifications of road infrastructure. During the laboratory classes analysis is provided for elongation of travel times due to temporary inaccessibility of selected streets in the city.

4. Computer-assisted operational activities: Classification and characteristics of various areas of application of decision-making support systems. Identification of problems at the operational level. Analysis of the vehicle routing problem. Variants and methods of solving. During the laboratory classes formulation, solution and analysis of a particular vehicle routing problem with time windows and the inhomogeneous fleet will be provided.

5. Computer-aided strategic actions: Identification and characterization of the problems at the strategic level. Problems of integration of transactional and analytical systems. Logistics center localization problem. Variants and methods of solving. Example of localization problem and analysis of operational data will be provided in the laboratory course.

6. Evolution of algorithms: Development of optimization systems with non-deterministic approaches. Evolution of optimization algorithms. Artificial intelligence, genetic algorithms, ant algorithms, cellular automata. Single and multi-criteria approach. Closed and open systems.

7. Advanced technologies in transportation management: GPS based localization of objects and fleet management. Capabilities and limitations of the commercial fleet management systems. Problems of integration of services from different vendors.

Basic bibliography:

1. Bielecka E., Systemy Informacji Geograficznej ? teoria i zastosowania, Wydawnictwo PJWSTK, Warszawa 2006
2. Długosz J. : Nowoczesne technologie w logistyce. PWE, Warszawa 2009
3. Kubicki J., Kuriata A.: Problemy logistyczne w modelowaniu systemów transportowych, Wyd. WKŁ Warszawa 2000
4. Gołembska E., Szymczak M.: Informatyzacja w logistyce przedsiębiorstw, Wydawnictwo naukowe PWN, Warszawa, 1997

Additional bibliography:

1. Michalewicz Z.: Algorytmy genetyczne + struktury danych = programy ewolucyjne, Wyd. Naukowo-Techniczne Warszawa 1999
2. Leyland V.: EDI Elektroniczna wymiana dokumentacji, Wydawnictwa Naukowo-Techniczne, Warszawa 1995
3. Narkiewicz J. : GPS. Budowa, działanie , zastosowanie. WKŁ, Warszawa 200

Result of average student's workload

Activity	Time (working hours)
1. Preparation for the lecture	5
2. Participation in the lecture	15
3. Learning of lectures content	4
4. Consultations	1
5. Preparation for the final test	8
6. Participation in the final test	2
7. Preparation for laboratory classes	14
8. Participation for laboratory classes	15
9. Preparation to pass the lab	3

Student's workload		
Source of workload	**hours**	**ECTS**
Total workload	81	3
Contact hours	33	1
Practical activities	46	2