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KA2 - Cooperation for innovation and the exchange of good practices

Capacity Building in Higher Education

Joint project

Master in Smart Transport and Logistics for Cities / SmaLog

Master Curricula

development and implementation

Lviv Polytechnic National University – LPNU

http://lp.edu.ua/education/majors/IEMT/3.275.03.04/52/2018/ua/full (UA)
http://lp.edu.ua/en/education/majors/IEMT/3.275.03.04/52/2018/en/full (Eng)
http://smalog-2017.uniroma2.it/deliverables/

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Transport Technologies Department

Project Acronym: SMALOG
Duration: 15/10/2017 - 14/10/2020
Project Coordinator: University of Rome Tor Vergata (Italy)
Proposal full title: Master in Smart transport and logistics for cities
Project number: 585832-EPP-1-2017-1-IT-EPPKA2-CBHE-JP
Document Title: Master Curricula
Authors: Antonio Comi, Mykola Zhuk, Volodymyr Kovalyshyn
Summary: Deliverable series presents the curricula process of the 2nd level Master developed for the Ukraine and Georgian Universities according to the Bologna process standards within the SmaLog project. This deliverable reports curricula developed and implemented at Lviv Polytechnic National University - LPNU. After a short introduction, the deliverable describes the local conditions and needs and the results of the international reviews on which the curricula have been built. The deliverable provides the structure in term of modules, the expected learning outcomes, the references publications and the needed materials in order to deliver the Master.

SmaLog at Lviv Polytechnic National University

Master objectives and profile of the Master graduates

The master degree in “Smart transport and logistics for cities” is developed within the branch of knowledge 27 “Transport”, specialty 275 “Transport technologies”.

Programme structure

The master course lasts two years for a total of 120 ECTS. According to the Law of Ukraine “On Education” and the Order of Ministry of Education and Science of Ukraine No. 1/9-126 when developing curricula, the following rules are taken into consideration:

- 1/3 hours – class work, 2/3 hours - independent study;
- Max 75% - compulsory discipline, Min 25% - free student choice;
- The curricula consists of two parts - Obligatory and Elective part.

Distribution of content of the educational-scientific program by groups of components and training cycles

№	Training cycle	Educational load of the applicant of higher education		
		Obligatory components of educational and scientific program	Elective components of educational and scientific program	Total for the whole period of study
1.	General training cycle	3 ECTS / 2,5 %	3 ECTS / 2,5 %	6 ECTS / 5 %
2.	Cycle of professional training	39 ECTS / 32,5 %	35 ECTS / 29,2 %	74 ECTS / 61,7 %
3.	Research (scientific) component	40 ECTS / 33,3 %		40 ECTS / 33,3 %
Total for the whole period of study		82 ECTS / 68,3 %	38 ECTS / 31,7 %	120 ECTS / 100 %

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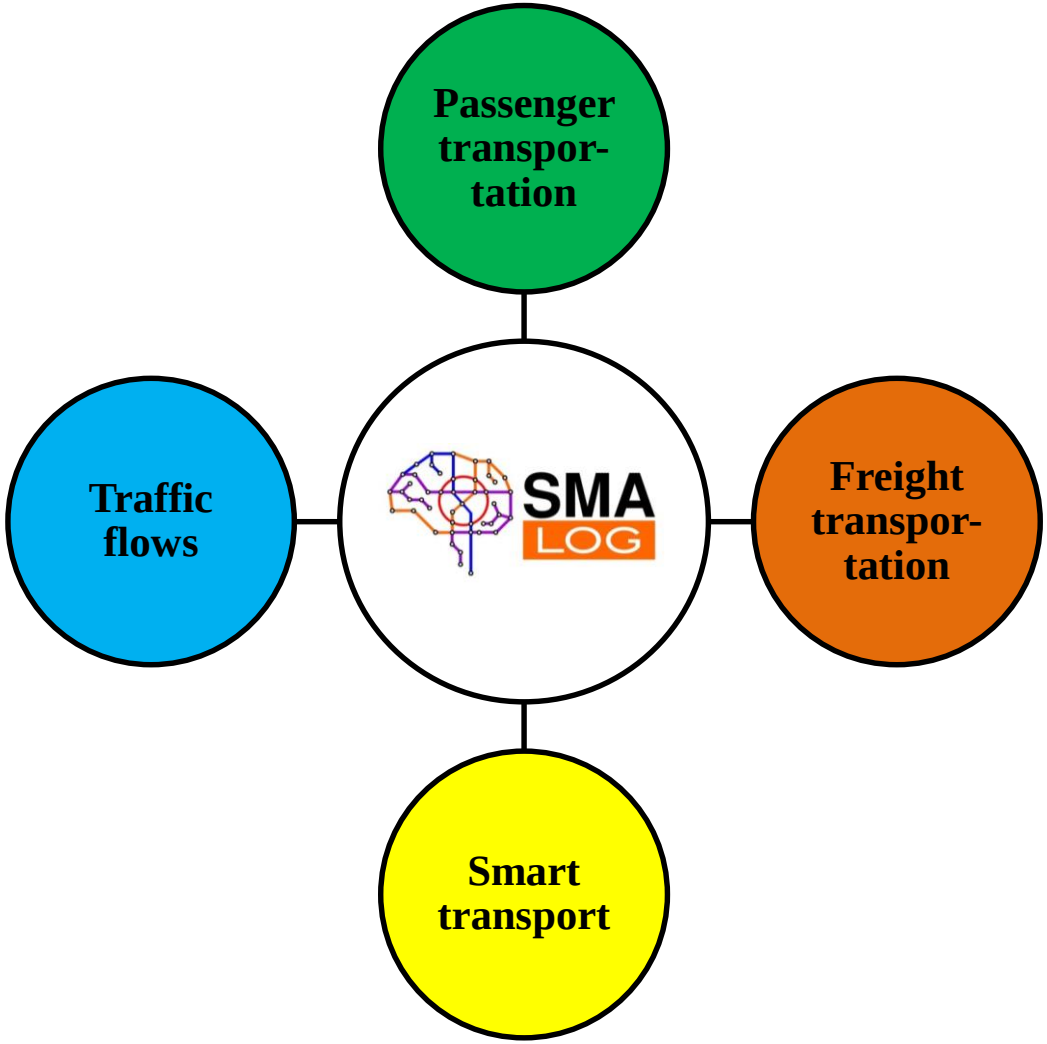
Subsystems of the educational-scientific program «SmaLog»



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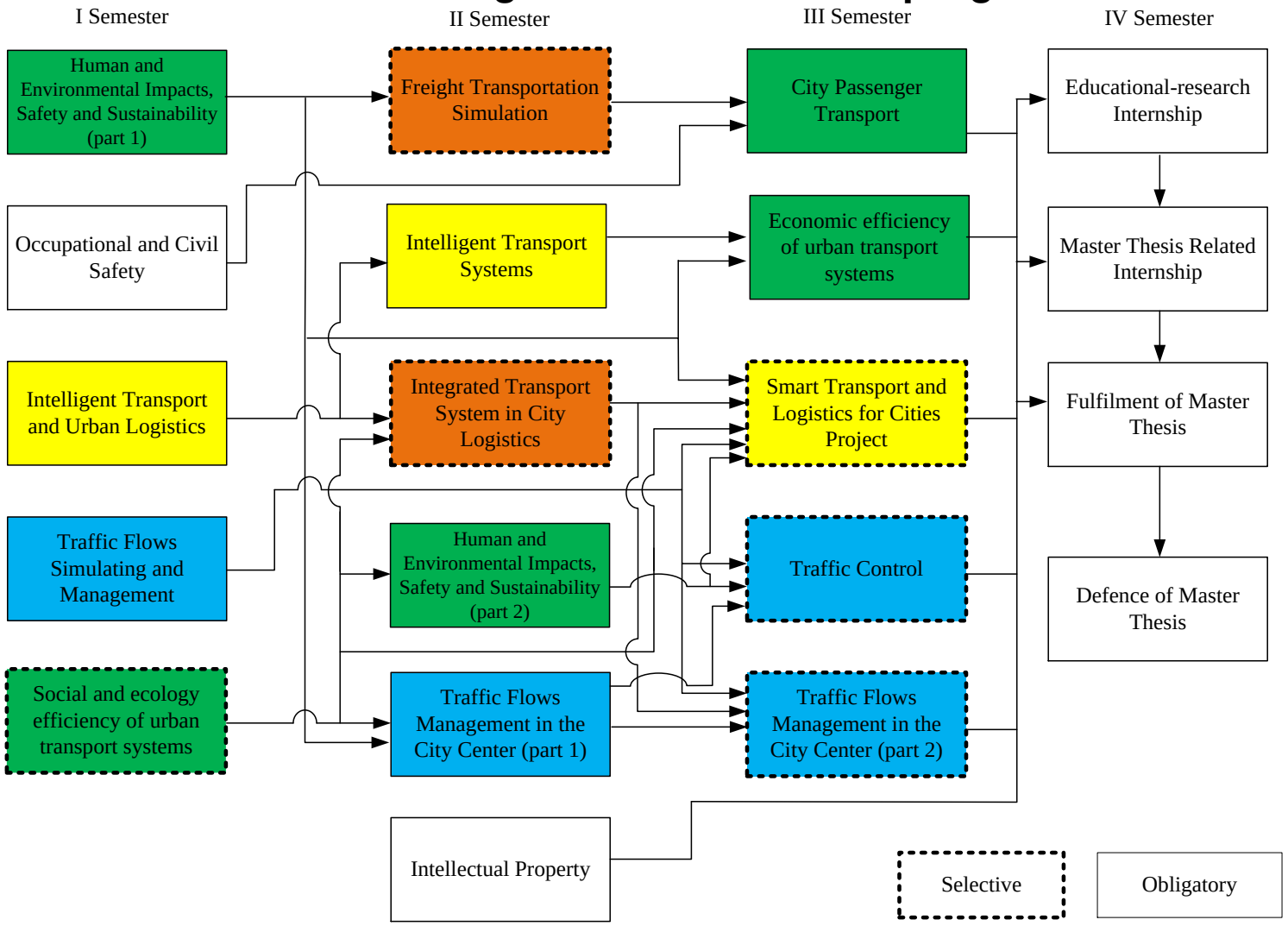
Structural-logistic scheme of the program



Curriculum developed at LPNU [1/4]

#	Module	Type of training	Semester	Semester control	The scope of work					Distribution by classes of classes, hours				Horn and graphics work	Control work	Chair
					Credit	Hours										
					ECTS	*Total*	*Audit work*	*MK*	*Independent work*	*Lectures*	*Laboratory*	*Practical*	*Weekly*			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	Total for specialty:				120	3600	870		2730	420	135	315		1	4	
	Compulsory academic disciplines				82	2460	465		1995	225	75	165		1	2	
	Selective disciplines of specialty:				38	1140	405		735	195	60	150			2	
	1. Professional disciplines of specialization				120	3600	870		2730	420	135	315		1	4	
	0400: Smart Transport and Logistics for Cities				90	2700	540		2160	270	75	195		1	3	
	1.1. Compulsory academic disciplines				82	2460	465		1995	225	75	165		1	2	
	1.1.1. General training cycle				3	90	30		60	15		15			1	
1	Economic Efficiency of Cities Transport Systems		3	test	3	90	30		60	15		15	1/2/1		1/12	TT
	1.1.3. Cycle of training preparation				79	2370	435		1935	210	75	150		1	1	
2	Intelligent Transport and Urban Logistics		1	Exam	7	210	60		150	30		30	2/4/2			TT
3	Traffic Flows Simulating and Management		1	Exam	6	180	75		105	30	30	15	2/5/1			TT

Curriculum developed at LPNU [2/4]

#	Module	Type of training	Semester	Semester control	The scope of work					Distribution by classes of classes, hours				Horn and graphics work	Control work	Chair
					Credit	Hours										
					ECTS	*Total*	*Audit work*	*MK*	*Independent work*	*Lectures*	*Laboratory*	*Practical*	*Weekly*			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
4	Occupational and Civil Safety		1	test	3	90	30		60	15		15	1/2/1	1/18		TB
5	Human and Environmental Impacts, Safety and Sustainability (P.1)		1	Exam	5	150	30		120	15		15	1/2/1			TT
6	Intelligent Transport Systems		2	Exam	6	180	75		105	30	15	30	2/5/2			TT
7	Human and Environmental Impacts, Safety and Sustainability (P.2)		2	Exam	5	150	45		105	30		15	2/3/1			TT
8	Traffic Flows Management in the City Center (P.1)		2	Exam	5	150	60		90	30	15	15	2/4/1		1/12	TT
9	City Passenger Transport		3	Exam	6	180	60		120	30	15	15	2/4/1			TT
10	Traffic Flows Simulating and Management	KP	1	test	3	90			90							TT
11	City Passenger Transport	KP	3	test	3	90			90							TT
12	Educational-research Internship	Int	4	test	4,5	135			135							TT
13	Master Thesis Related Internship	Int	4	test	6	180			180							TT
14	Fulfilment of Master Thesis		4		18	540			540							TT
15	Defence of Master Thesis		4		1,5	45			45							TT
	1.2. Discipline at the student's choice				8	240	75		165	45		30			1	

Curriculum developed at LPNU [3/4]

#	Module	Type of training	Semester	Semester control	The scope of work					Distribution by classes of classes, hours				Horn and graphics work	Control work	Chair
					Credit	Hours										
					ECTS	*Total*	*Audit work*	*MK*	*Independent work*	*Lectures*	*Laboratory*	*Practical*	*Weekly*			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
	1.2.5. Educational disciplines of other educational programs				8	240	75		165	45		30			1	
16	1. Discipline to choose		2	test	3	90	30		60	15		15	1/2/1		1/12	KGSD
17	Intellectual Property		2	test	3	90	30		60	15		15	1/2/1		1/12	MAM
18	Role of Religion in Modern Society		2	test	3	90	30		60	15		15	1/2/1		1/12	KF
19	Phylosophical Problems of Sciencie Knowledge		2	test	3	90	30		60	15		15	1/2/1		1/12	KF
20	2. Subjects to Choose		2	Exam	5	150	45		105	30		15	2/3/1			TT
21	2.1. Integrated Transport System in City Logistics		2	Exam	5	150	45		105	30		15	2/3/1			TT
22	2.2. Bus Rapid Transit		2	Exam	5	150	45		105	30		15	2/3/1			TT
	0401: PART 0401				30	900	330		570	150	60	120			1	
	1.2. Discipline at the student's choice				30	900	330		570	150	60	120			1	
	1.2.3. Cycle of professional training				30	900	330		570	150	60	120			1	
23	Social and Ecology Efficiency of Cities Transport Systems		1	Exam	6	180	60		120	30		30	2/4/2			TT
24	Freight Transportation Simulation		2	Exam	6	180	75		105	30	30	15	2/5/1			TT

Curriculum developed at LPNU [4/4]

#	Module	Type of training	Semester	Semester control	The scope of work					Distribution by classes of classes, hours				Horn and graphics work	Control work	Chair
					Credit	Hours										
					ECTS	*Total*	*Audit work*	*MK*	*Independent work*	*Lectures*	*Laboratory*	*Practical*	*Weekly*			
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
25	Smart Transport and Logistics for Cities Project		3	Exam	6	180	60		120	30		30	2/4/2			TT
26	Traffic Control		3	test	6	180	60		120	30		30	2/4/2		1/12	TT
27	Traffic Flows Management in the City Center (P.2)		3	Exam	6	180	75		105	30	30	15	2/5/1			TT

(*) ECTS. For the determination of the ECTS it is agreed that 1 ECTS is equivalent to 30 hours of work.

Obligatory part

The compulsory part counts 82 ECTS and includes - General training cycle, Cycle of professional training, Research (scientific) component. The Table below reports the modules of the project which are included to the obligatory part.

Modules of the project which are included to the obligatory part

Code of the module	Module	ECTS credits	Form of final control
1	2	3	4
1. General training cycle			
OC 1.1.	Economic efficiency of urban transport systems	3	Test
Total per cycle:		3	
2. Cycle of professional training			
OC 2.1.	Occupational and civil safety	3	Test
OC 2.2.	City passenger transport	9	Exam
OC 2.3.	Intelligent transport and urban logistics	7	Exam
OC 2.4.	Traffic flows simulating and management	9	Exam
OC 2.5.	Intelligent transport systems	6	Exam
OC 2.6.	Traffic flows management in the city center (part 1)	5	Test
Total per cycle:		39	
3. Research (scientific) component			
OC 3.1.	Human and environmental impact, safety and sustainability (part 1)	5	Test
OC 3.2.	Human and environmental impact, safety and sustainability (part 2)	5	Exam
OC 3.3.	Educational research internship	4,5	Test
OC 3.4.	Master thesis related internship	6	Test
OC 3.5.	Fulfilment of master thesis	18	
OC 3.6.	Defense of master thesis	1,5	State attestation
Total per cycle:		40	
Total for obligatory components:		82	

Elective part

The elective part counts 38 ECTS and includes - General training cycle, Cycle of professional training. The Table below reports the modules of the project which are included to the elective part.

Modules of the project which are included to the elective part

Code of the module	Module	ECTS credits	Form of final control
1. General training cycle			
SC 1.1.	Intellectual Property	3	Test
Total:		3	
Professional disciplines of specialization			
SC 2.1.	Social and ecology efficiency of urban transport systems	6	Exam
SC 2.2.	Smart transport and logistics for cities project	6	Exam
SC 2.3.	Traffic control	6	Test
SC 2.4.	Traffic flows management in the city center (part 2)	6	Exam
SC 2.5.	Freight transportation simulation	6	Exam
Total:		30	
Elective components of other educational-scientific programs			
SC 4.1	Integrated Transport System in City Logistics	5	Test
Total:		5	
Total for elective components:		38	

Educational objectives [1/5]

Program competencies

Integral competence:

- Ability to solve complex tasks and problems in certain branch of professional activity or in study process which provides the pursuance of research and/or implementation of innovations and is characterized by uncertainty of conditions and requirements.

General competencies:

- Ability to initiate, develop and perform individually or in national (international) group projects on operations improvement on transport.
- Ability to organize the group work and also motivate and manage its work.
- Ability to searching, processing and analyzing information from different sources with the help of modern informational and communication technologies.
- Ability to determine economic factors and provide the quality of conducting operations during the development and realization of complex actions and projects in compliance with the conditions of work, regulations of civil defense and environmental protection.
- Ability to communicate with professional and general audience, present information in oral, printed or other forms in native of foreign language on professional level.
- Ability to use in practice different theories in the field of study, effectively using general pedagogical concepts.
- Ability to pursue research within narrow specialization, detect problems, set tasks and solve them using appropriate methods of scientific research.

Educational objectives [2/5]

Professional competencies:

- Ability to study and manage the functioning of integrated transport systems.
- Ability to determine and implement promising directions of transport process simulation.
- Ability to use modern technologies of freight forwarding activity.
- Ability to perform project analysis for innovative and investment projects.
- Ability to manage the supply chains and logistic centers.
- Ability to manage the freight transportation by means of transport.
- Ability to manage the passenger transportation by means of transport.
- Ability to research and control the movement of vehicles.
- Ability to manage the reliability and effectiveness of transport technologies by means of transport.
- Ability to use the modern methods of navigation in transport technologies by means of transport.

Professional competencies of specialty:

- Ability to use smart transport and logistics in cities.
- Ability to conduct an assessment of transport systems in city infrastructure.
- Ability to operate traffic flows in cities.
- Ability to operate the movement on sections of transport network.
- Ability to simulate route systems.
- Ability to use information technologies in traffic flow management.
- Ability to provide consolidation of freight flows.
- Ability to use multimodal transit systems.
- Ability to perform the designing of systems of smart transport and logistics in cities.
- Ability to conduct an assessment of reliability and safety of city logistics.
- Ability to research the psychology of movement and the influence of a person on transport system reliability.
- Ability to research and manage the traffic flows in city centers.
- Ability to determine the effectiveness of city transport systems.
- Ability to determine the influence of transport on environment.

Educational objectives [3/5]

For special (professional, subject) competencies:

- Improvement of approaches and methods for research and management of functioning of the integrated transport systems.
- Justification of reasonability of measures for transport technologies improvement with the use of transport processes simulation. Conduct an assessment of effectiveness of chosen measures.
- Justification of the reasonability of implementation of modern technologies of freight forwarding service.
- Improvement of the approaches and methods for conducting the commercial, technical, social, ecological, institutional, financial and economic analysis during development innovative and investment projects.
- Analysis and justification of the implementation of the modern methods, to have the ability to conduct an analysis and calculation of economic operating rates of supply chains and logistic centres.
- Use of the informational resources for improving the supply chain modelling.
- Elaboration of measures for management of freight transportation using simulation of processes of freight transportation by means of transport.
- Elaboration of the measures for management of passenger transportation using simulation of processes of freight transportation by means of transport.
- Analysis and justification of the expediency of scientific recommendations appliance and modern methods of vehicle movement management.
- To have skills of investigation the theoretical and experimental models of management of reliability and effectiveness of transport technologies by means of transport.
- To justify the expediency of application of modern methods of navigation in transport technologies by means of transport.

Educational objectives [4/5]

Skills:

- To analyse and develop methods of transport processes research.
- To simulate material and transport flows.
- To find optimal solutions of application of smart transport and logistics in cities.
- To estimate the effectiveness of city transport systems.
- To analyze and simulate traffic flows in city centers.
- To estimate and forecast the parameters of material and human flows.
- To estimate existing and develop progressive methods of traffic flow management.
- To forecast and design systems of smart transport in cities.
- To forecast the development of transport services market.
- To estimate the influence of people and environment on the safety and stability of city logistics.

Educational objectives [5/5]

Communication:

- Ability to communicate including oral and written communication in Ukrainian language and at least one of the common foreign languages;
- Ability to carry out explanatory and awareness-building work among different groups and segments of population with the aim of using the smart transport and logistics in cities;
- Ability to describe the results of scientific research on smart transport and logistics in publications in national and foreign specialized publications.

Autonomy and responsibility:

- Ability to adapt to new situations and make decisions on its own;
- Ability to aware the necessity of life-long learning with the aim of deepening of acquired and acquisition of new professional knowledge;
- Ability to be responsible for the ongoing work and achieve the set aim with the adherence to the requirements of professional ethics.

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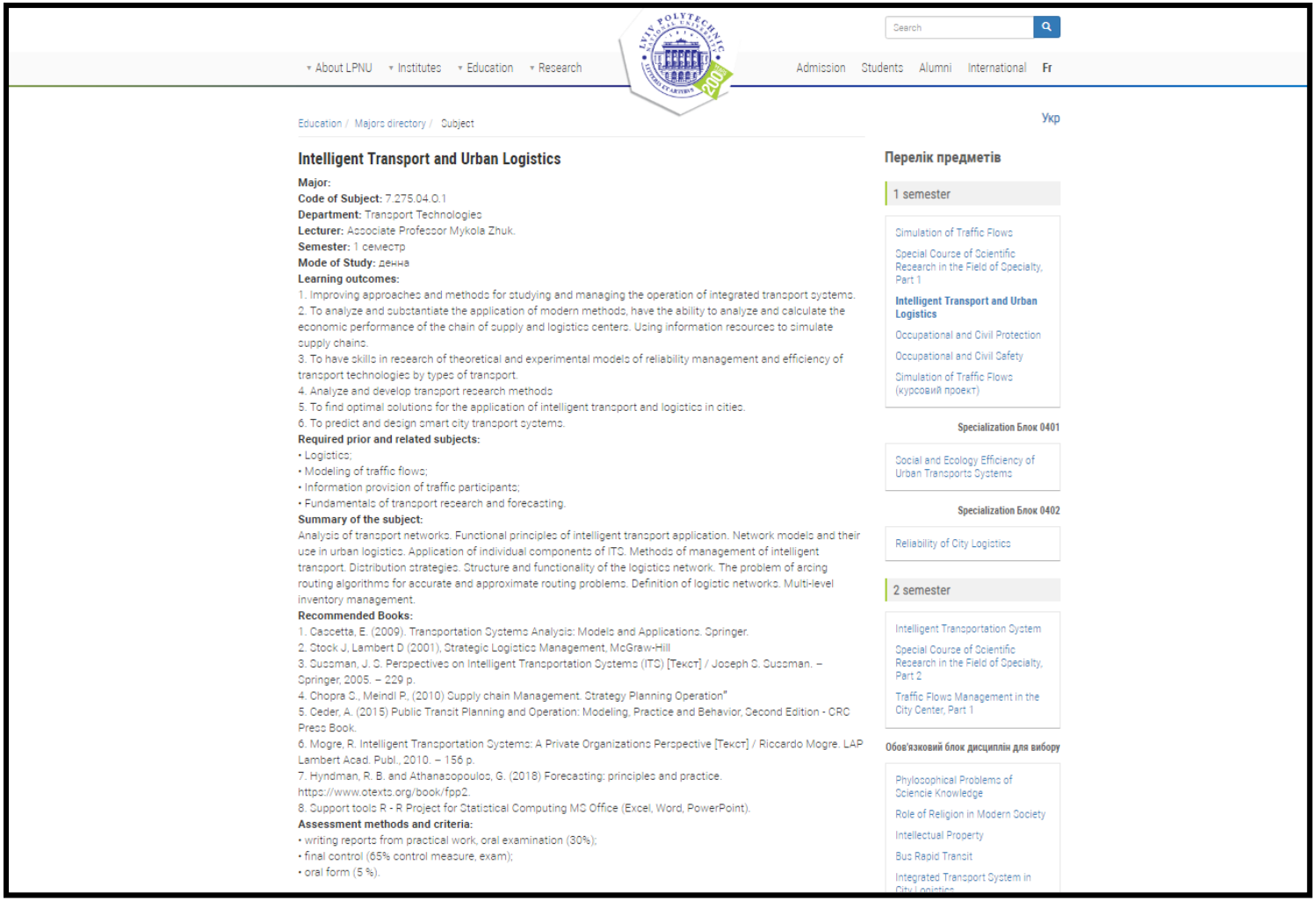
Description of the module at website LPNU



Education / Majors directory / Subject

Укр

Intelligent Transport and Urban Logistics

Major:
Code of Subject: 7.275.04.O.1
Department: Transport Technologies
Lecturer: Associate Professor Mykola Zhuk.
Semester: 1 семестр
Mode of Study: денна
Learning outcomes:
1. Improving approaches and methods for studying and managing the operation of integrated transport systems.
2. To analyze and substantiate the application of modern methods, have the ability to analyze and calculate the economic performance of the chain of supply and logistics centers. Using information resources to simulate supply chains.
3. To have skills in research of theoretical and experimental models of reliability management and efficiency of transport technologies by types of transport.
4. Analyze and develop transport research methods
5. To find optimal solutions for the application of intelligent transport and logistics in cities.
6. To predict and design smart city transport systems.
Required prior and related subjects:
• Logistics;
• Modeling of traffic flows;
• Information provision of traffic participants;
• Fundamentals of transport research and forecasting.
Summary of the subject:
Analysis of transport networks. Functional principles of intelligent transport application. Network models and their use in urban logistics. Application of individual components of ITS. Methods of management of intelligent transport. Distribution strategies. Structure and functionality of the logistics network. The problem of arcing routing algorithms for accurate and approximate routing problems. Definition of logistic networks. Multi-level inventory management.
Recommended Books:
1. Cascetta, E. (2009). Transportation Systems Analysis: Models and Applications. Springer.
2. Stock J, Lambert D (2001), Strategic Logistics Management, McGraw-Hill
3. Sussman, J. S. Perspectives on Intelligent Transportation Systems (ITS) [Текст] / Joseph S. Sussman. – Springer, 2005. – 229 p.
4. Chopra S., Meindl P. (2010) Supply chain Management. Strategy Planning Operation"
5. Ceder, A. (2015) Public Transit Planning and Operation: Modeling, Practice and Behavior, Second Edition - CRC Press Book.
6. Mogre, R. Intelligent Transportation Systems: A Private Organizations Perspective [Текст] / Riccardo Mogre. LAP Lambert Acad. Publ., 2010. – 156 p.
7. Hyndman, R. B. and Athanasopoulos, G. (2018) Forecasting: principles and practice. https://www.otexts.org/book/fpp2.
8. Support tools R - R Project for Statistical Computing MS Office (Excel, Word, PowerPoint).
Assessment methods and criteria:
• writing reports from practical work, oral examination (30%);
• final control (65% control measure, exam);
• oral form (5 %).

Перелік предметів

1 semester

Simulation of Traffic Flows
Special Course of Scientific Research in the Field of Specialty, Part 1
Intelligent Transport and Urban Logistics
Occupational and Civil Protection
Occupational and Civil Safety
Simulation of Traffic Flows (курсовий проект)

Specialization Блок 0401

Social and Ecology Efficiency of Urban Transports Systems

Specialization Блок 0402

Reliability of City Logistics

2 semester

Intelligent Transportation System
Special Course of Scientific Research in the Field of Specialty, Part 2
Traffic Flows Management in the City Center, Part 1

Обов'язковий блок дисциплін для вибору

Philosophical Problems of Sciencie Knowledge
Role of Religion in Modern Society
Intellectual Property
Bus Rapid Transit
Integrated Transport System in City Logistics

http://lp.edu.ua/en/education/majors/IEMT/3.275.03.04/52/2018/en/full

Employment opportunities

Graduates who hold a Master degree in the field of Smart transport and logistics for cities (Transport Technology (in motor transport)) may have the following professional titles (according to Ukrainian encoding):
2149.1 - scientific staff;
2149.2 - engineers;
2149 - professionals in other fields of engineering;
2310 - teachers of universities and higher educational establishments;
2359 - other professionals in the field of education;
2359.1 - other academic staff in the field of training under the Classification of Occupations are valid from November 1, 2017.

Graduates will be able to hold the following positions:

- Engineer in management and organization of transportation (II category);
- Transport engineer at transport enterprises, in the management of public and passenger transport, transport and communications management of the region, district and city administration, in research laboratories of design institutes and institutes of forensic examinations, in transport and forwarding enterprises;
- Engineer in employee training and retraining departments;
- Teacher of higher education institution, assistant in higher educational establishments;
- Junior researcher at research and development institutions of transport, design organizations.

Internship

Internship for students consists of two types:

1. Scientific practice;
2. Practice on the topic of master's work.

A student can practice, for example:

- in research institutions;
- at the departments of the university;
- in transport companies;
- in public or private institutions;
- in colleges and vocational schools.

The plan of design and experimental work of the student is approved by the head. After completing the practice, the student must pass the assessment of the preparation and make a test, which is conducted at the department.

Master thesis

The achievement of the Master's degree involves defence of the thesis.

Students begin to write thesis and defend **in 4th semester**. **Date of defence thesis is June 2020**.

Master thesis includes : Fuifilment **18 ECTS;** Defence **1,5 ECTS.**

Before starting to develop a thesis, student has to pass:

- all modules of Master program
- Internship.

The themes of Master's thesis are approved by the order of the University.

Examination Commission process are public and open for all stakeholders.