



“Communications and Information Systems in Smart Transportation”

Syllabus

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Version 1

1 Name of the course

Communications and Information Systems in Smart Transportation

2 ECTS credits

6 Credits, **(45H Theory; 30H Exercises + Lab)**

This lecture provides students with communication and its role in organizing transport services, information support of the transport process, the purpose and type of communication systems and means of transport, their characteristics, the areas of application of various communication systems in transport, as well as information flows in transport systems, their relationship with the global system of transmission, storage and processing of information. The course provides for the study of the fundamentals of Automated control system (ACS) of vehicle designed to optimize the management processes of transport systems. The structure and levels of developing the automated control system for transport, their functions, algorithms for efficient operational decision-making, technical and information support for the automatic control system, and management systems are considered. Students learn the basics of data transfer, as well as the concept of databases and data banks.

3 Objectives

The objective of teaching courses for students of these specialties is the formation of a system of scientific and professional knowledge of skills in the field of road transport management.

The main tasks of studying the discipline are:

- forming students of scientific thinking, the ability to put it into practice, information systems;
- understanding of social and humanitarian orientation - mastering by program-targeted methods of system analysis and forecasting of information flows;
- the creation of students of the basics of theoretical training in the field of ATP management;
- the development of students' techniques and skills in solving engineering problems associated with the management and intensification of production, economic problems.

4 Learning outcomes

The general expectation regarding the knowledge to be provided/acquired is as follows:

- role of communication in the organization of transport services;
- the purpose and types of systems and means of communication in transport;
- spheres of application of various communication systems in transport;
- algorithms for effective operational decisions;
- ACS on transport;
- integration of the global system for transmitting, storing and processing information with information flows in transport systems.

5 Contents

1. Introduction
 - 1.1 Classification and architecture of transport telematics
 - 1.2 The main subsystem of transport telematics systems
 - 1.3 The European concept of the implementation of transport telematics
2. TELEMATIC SYSTEMS IN CITIES
 - 2.1 The basic principles of the urban traffic management system
 - 2.2 Traffic management system on urban networks
 - 2.3 The method of optimization of traffic control on the network of city roads –
TRANSYT
 - 2.4 System with centralized intelligence (SCOOT and SCATS)
 - 2.5 Systems with decentralized intelligence
 - 2.6 Expert management methods
3. CITY PASSENGER PUBLIC TRANSPORT
 - 3.1 Urban public transport and telematics
 - 3.2 Ensuring the priority movement of urban public transport
4. ORGANIZATION VEHICLE PARKING
 - 4.1 Application of telematics devices on parking
 - 4.2 Parking capacity on public roads
 - 4.3 Interception parking type P + R
 - 4.4 Parking information via the Internet
5. AUTOMATED TRAFFIC MANAGEMENT SYSTEMS
 - 5.1 A system to Enhancement traffic safety on the roads
 - 5.2 System to improve the uniformity and safety of the column movement of
vehicles
 - 5.3 Intellectual control systems of traffic flow on highways
6. INFORMATION TECHNOLOGY S IN TRANSPORT
 - 6.1 International experience in the creation of information technology in transport
 - 6.2 Integration of information technology in the framework of transport system
 - 6.3 Information technology affecting the state of the transport flow in the
framework of the transport system
 - 6.4 Information technology in individual vehicles
 - 6.5 Passive Information Technology
7. ELECTRONIC PAYMENT SYSTEM FOR TRANSPORT
 - 7.1 The architecture of the electronic payment system for transport EFC
 - 7.2 Communication technology in the system EFC
 - 7.3 Comparison of different electronic payment technologies
8. SECURITY SYSTEMS FOR ROAD SAFETY
 - 8.1 Timely information about the traffic accident

8.2 Devices to warn drivers about exceeding the permissible speed

8.3 Weighing vehicles without stopping them

9. COMMUNICATIONS INFRASTRUCTURE

8.1 Basic concept

8.2 Introduction to telecommunication networks

8.3 Separation of telecommunication services

8.4 Classification of telecommunication services

8.5. Implementation of telecommunication and radio communication networks

10. EXERCISES

10.1. -Appointment and types of systems and means of communication in transport, and their characteristics.

10.2. Scope of application of various communication systems in transport

10.3. The concept of databases and data banks as an information support automated control system.

10.4. Computer networks and telecommunications as technical support of an automated control system

10.5. Information flows in transport systems, their relationship with the global system of transmission, storage and processing of information

10.6 Automated control system as a tool for optimizing management processes in transport systems

10.7 Algorithms for effective operational decision making

6 Teaching method

Lectures, case studies, tutorials/exercises

- The slides are available for the whole course. They are provided to students (or uploaded in the MOODLE system). The full contents of each slide is systematically explained by the Lecturer. Additional examples which are not included in the slides are proposed by the Lecturer to allow good understanding of the information provided.
- The slides contain exercises with solutions for the good understanding of the content of each chapter. These solutions are systematically explained (during the lecture) by the Lecturer.
- The slides contain also exercises without solutions. They should be solved by students during the lecture (this is part of oral exam). The students are fully assisted by the Lecturer in order to obtain correct/exact solutions to the proposed exercises. This should help to check whether the students have understood the chapters or not.
- Several exercises are proposed by the Lecturer to be solved by students as projects. This should help to test the self-learning potential of students.

7 Assessment method

Mid-term and final oral and/or written examination, exercises from case studies.

8 Textbooks - Publications - Software

Textbooks

- Pavel Pribyl, Miroslav Svítek: Telematics on transport. Translation from Czech edited by Professor V.V. Silyanova. Moscow. MARI(STU), 2003-540 p.

-Muthucumaru Maheswaran, Elarbi Badidea: Handbook of Smart Cities. Software Services and Cyber Infrastructure. Springer Nature Switzerland AG 2018 -405 p.

- SMART TRANSPORTATION GUIDEBOOK. Planning and designing highways and streets that support sustainable and livable communities. 2008-92 p.

-INTEGRATING INTELLIGENT TRANSPORTATION SYSTEMS WITHIN THE TRANSPORTATION PLANNING PROCESS. Federal Highway Administration Office of Traffic Management and ITS Applications Office of Environment and Planning. 1998 -274p.

-Transport communications. Published by Kogan Page Ltd. London and Philadelphia U.K. 10 September 2007.

- Otto Strobel. Communication in Transportation Systems. Germany. 2013-482 p.

- Myer Kutz. Handbook of Transportation Engineering, Volume I: Systems and Operations, Second Edition. 2011 McGraw-Hill Education.

Software

- TRANSYT

