**“Traffic Management and Scheduling for Railways”**

**Syllabus SCR.05/03**

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Version 1

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SCR 05/3

# Name of the course

**Management and Scheduling for Railways**

# ECTS credits

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

In the process of education of this subject, students will acquire knowledge of the problems of the organization of wagon flows and train formation. Another task of subject is to teach the students to design of the train traffic graph as a document for the basic and operation management of work in railway transport. Furthermore, the knowledge will be deepened by quantitative and time elements of the train timetable as a basis for determining the permeability of railway facilities, basic concepts and issues of the organization of rail transport. By elaborating the semester assignments, the student will acquire the competence to solve tasks from the above mentioned topics.

# Objectives

The main objectives of this lecture are following:

* Introduction to the railway transport and operation
* Train formation problem: characteristics, purpose, principles and schedule of train formation plan
* Background documents for the diagram of train transport and evaluation criteria
* Hierarchical structure of freight trains
* Background and norms for the train transport layout
* Principles of the construction of the train diagram
* Station and track lines intervals
* Principles of detecting the occupation time in train diagram, the difference between the maximum (theoretical) and practical capacity of railway infrastructure
* Problems of train tracking and allocation of railway transport capacity
* Operational management of railway transport
* Passenger transport and its position in the transport system, the role of each mode of transport, the main role of rail transport
* Rolling stock circulation, turn, vehicle maintenance principles

# Learning outcomes

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

* acquiring basic knowledge in the field of rail transport, knowledge of the graphical train diagram and possibilities of its optimization
* designing a train diagram and timetables in railway transport
* optimization of transport processes in rail transport
* familiarization with IT technologies to support of management in railway transport

# Contents

1. INTRODUCTION

1.1 Definition of the railway transport

1.2 Definition of train formation problem

1.3 Introduction to the creation the rail timetables and train diagrams

1. Characteristic of train formation problems

2.1 Purposes and principles of train formation problem

2.2 Creation of train formation schedule

2.3 Hierarchical structure of freight trains

2.4 Algorithms and methods used in compiling a Train formation problem

1. Train diagram and timetable

3.1 Documentations and norms for the construction of train diagram and timetable

3.2 Kinds of trains diagram

3.3 Principles of the design the train diagram and timetable

1. Stations and track lines intervals

4.1 Station operating intervals

4.2 Track line operating intervals

4.3 Principles of detection the occupation time

1. Capacity of railway infrastructure

5.1 Capacity definition of railway infrastructure

5.2 Railway transport capacity - methodology for determining the permeability of railway equipment in a constructed timetable

5.3 Railway infrastructure capacity - methodology for determining the permeability of railway equipment in the prospective timetable

5.4 Railway infrastructure capacity - UIC methodology for determining railway infrastructure capacity.

5.5 Optimizing the use of railway infrastructure capacity. Problems of determination of free capacity

1. Allocation of railway transport capacity

6.1 Definition of train paths

6.2 Regular train paths

6.3 “Ad–hoc” train paths

6.4 Role of Infrastructure manager in capacity allocation

1. Basic and operational management of the railway transport

7.1 Introduction

7.2 Trains movement - management and securing

7.3 Dispatch management on the railways

7.4 Railway transport management in crisis situations - Investigation of accidents

8. Rolling stocks

8.1. Characteristic of railway rolling stocks

8.2. Circulation and turns of rolling stocks

8.3. Maintenance of rolling stocks

# 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.

# Assessment method

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

# Textbooks - Publications - Software

**Textbooks**

* GAŠPARÍK, J. et al.: Railway Traffic Operation. 1. vyd. EDIS Žilinská univerzita 2016, 278 p. ISBN 978-80-554-1281-8
* Široký, J., Cempírek, V. Gašparík, J.: Transport technology and control, Tribun EU s.r.o., Brno, 2012, 238 p., ISBN: 978-80-263-0268-1
* Hasselgren. B.: Transport Infrastructure in Time, Scope and Scale, Palgrave Macmillan, 2018, 121 p., ISBN 978-3-319-79053-4
* Setola R., Sforza A., Vittorini V., Pragliola C.: Railway Infrastructure Security (Topics in Safety, Risk, Reliability and Quality), Springer, 2015, 249 p. ISBN 978-3319044255
* Yi Sirong, Principles of Railway Location and Design, Academic Press; 1 edition, 2017, 646 p., ISBN 978-0128134870
* Pyrgidis N. C.: Railway Transportation Systems: Design, Construction and Operation, CRC Press, 511 p., ISBN 978-1482262155

**Selected relevant Publications**

* https://traffic.fpz.hr/index.php/PROMTT
* https://etrr.springeropen.com/
* https://content.sciendo.com/view/journals/ttt/ttt-overview.xml

Software OPEN SOURCE??? SPECIFY

* ZONA
* Byron
* Open Track