



**GRADUATE STUDY: TRANSPORT**

**SEMESTER (II)**

**Syllabus**

Academic year 2021/2022

Course: <b>Railway Transport Computer Modelling</b>					
Head of course: Prof. <b>Tomislav Josip Mlinarić</b> , Ph.D. Asst. Prof. <b>Marjana Petrović</b> , Ph.D.					
Co-lecturers: <b>Ivica Ljubaj</b> , MSc Traff. Eng.					
Semester: <b>II</b>	Course code: <b>60616</b>	Lectures: <b>30</b>	Auditory exercises: <b>10</b>	Laboratory exercises: <b>5</b>	ECTS credits: <b>5</b>
Group for lectures: <b>10 students</b>			Group for auditory and laboratory exercises: <b>10 students</b>		

**Objective of the course:**

- explain use of computer models in railway transport
- present tools and methods for computer model development in railway transport

**Learning outcomes:**

After the completion of the course the students will be able to:

1. explain use of computer models in railway transport
2. develop computer models of existing railway systems by using different software
3. analyse model and evaluate solutions

**LECTURES EXERCISES and SEMINARS**

Week	Syllabus	Form of classes	Performed by	Lessons	Remark
1.	<ul style="list-style-type: none"><li>Introduction to the area of Computer Modelling</li></ul>	L	Tomislav Josip Mlinarić	3	
2.	<ul style="list-style-type: none"><li>Models in transportation system</li></ul>	L	Marjana Petrović	3	
3.	<ul style="list-style-type: none"><li>Railway Infrastructure Modelling</li></ul>	L	Marjana Petrović	3	
4.	<ul style="list-style-type: none"><li>Modelling of transport entities</li></ul>	L	Marjana Petrović	3	
5.	<ul style="list-style-type: none"><li>Transportation Demand Models</li></ul>	L	Marjana Petrović	3	
6.	<ul style="list-style-type: none"><li>Application of models in real world</li></ul>	L	Marjana Petrović	3	
7.	<ul style="list-style-type: none"><li>Development of microsimulation models</li></ul>	L	Tomislav Josip Mlinarić	3	
8.	<ul style="list-style-type: none"><li>Application of Computer Modelling in Timetable Planning Process</li></ul>	L	Tomislav Josip Mlinarić	3	
9.	<ul style="list-style-type: none"><li>Railway Line Capacity Research by Appliance of Computer Modelling</li></ul>	L	Tomislav Josip Mlinarić	3	



10.	▪ Analysing of railway computer model results	L	Tomislav Josip Mlinarić	3	
11.	▪ Modelling of Railway Infrastructure (OpenTrack Planning and Simulation Tool)	AE	Ivica Ljubaj	3	
12.	▪ Modelling of Railway Signalling system (OpenTrack Planning and Simulation Tool)	AE	Ivica Ljubaj	3	
13.	▪ Modelling of rolling stock (OpenTrack Planning and Simulation Tool)	AE	Ivica Ljubaj	3	
14.	▪ Analyzing the capacity of railway lines (OpenTrack Planning and Simulation Tool)	S	Ivica Ljubaj	3	
15.	▪ Analyzing the capacity of railway lines (OpenTrack Planning and Simulation Tool)	S	Ivica Ljubaj	3	

L = Lectures; AE = Auditory Exercises; LE = Laboratory Exercises; S = Seminars





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## STUDENT OBLIGATIONS AND EXAMS

### Conditions for obtaining signatures:

Attendance is mandatory and students are required to attend at least 50% of the classes and make Seminar.

**Written and oral exam:** At the end of the course students are obligatory to present their seminar work and pass an oral examination. The student has to answer the question in such a way as to demonstrate sufficient knowledge of the subject in order to pass the oral exam.

## LITERATURE

### a) Obligatory literature:

1. I.A. Hansen, J. Pahl: Railway Timetable & Traffic – Analysis – Modelling - Simulation, EURAIL PRESS 2008.
2. E. Anders at all: Railway Signalling & Interlocking, Eurailpress, Hamburg, 2009.
3. ITE: Transportation Planning Handbook, 4th edition, Wiley, 2016

### b) Recommended literature:

1. P. Winter: Compendium on ERTMS, International Union of Railways, 2009.





## **METHODOLOGY OF THE IMPLEMENTATION OF THE COURSE PLAN**

### **1. LECTURES**

In the course of the lectures the theoretical framework of the curriculum is presented and followed by practical examples. To this end Power Point presentations are used.

### **2. AUDITORIAL EXERCISES**

In the course of exercises students are required to practice diverse calculations solving challenges in order to define all necessary parameters for a railway transport system.

### **3. SEMINARS**

Students need to develop computer model.





#### 4. DOCUMENTATION

Attendance list is signed by students prior to every lecture.

#### 5. SCORING SYSTEM

**Table 1** The scoring system for the monitoring of students and explained credit values in ECTS credits

Activity	ECTS credits
Class attendance	1,5
Seminar	1
Oral exam	2,5
In total:	5

#### METHODS OF MONITORING QUALITY THAT ENSURE ACQUISITION OF EXIT COMPETENCES

The student's attendance record is kept during the semester. At the end of the semester an evaluation of the quality and efficiency of the course and the lecturers will be carried out. Information on the achievement of learning outcomes and student progress will be used by teachers for self-evaluation and improvement of teaching methods.

