# I. Subject Specification

### 1. Basic Data

1.1 Title

## **HIGHWAY AND RAILWAY DESIGN**

1.2 *Code* 

## **BMEEOUVAI43**

1.3 *Type* 

Module with associated contact hours

1.4 Contact hours

Type	Hours/week / (days)
Lecture	3
Seminar	2

#### 1.5 Evaluation

Exam

1.6 Credits

5

# 1.7 Coordinator

name	Dr. Ákos VINKÓ	
academic rank	Assistant professor	
email	vinko.akos@emk.bme.hu	

### 1.8 Department

Department of Highway and Railway Engineering

1.9 Website

### \$@COURSEVIEWBYID\*3584@\$

https://edu.epito.bme.hu/course/view.php?id=3584

1.10 Language of instruction

english

## 1.11 Curriculum requirements

Compulsory in the Specialization in Infrastructure Engineering (BSc) programme

### 1.12 Prerequisites

• Roads (BMEEOUVAT42)

### 1.13 Effective date

1 September 2022

## 2. Objectives and learning outcomes

#### 2.1 Objectives

To get to know the role of rail and road transport, the planning and decision-making process for infrastructure investment, basic principles of alignment design, operation, and control. In addition, students can deepen their understanding in practice from the concrete cases.

#### 2.2 Learning outcomes

Upon successful completion of this subject, the student:

### A. Knowledge

- 1. will learn the alignment design principles of horizontal and vertical alignment on tramways
- 2. will learn the layout design of tramway track connections, the application areas of turnouts,
- 3. will learn the operation modes of tramway turnouts,
- 4. will learn the widely applied tramway track superstructures and their construction methods

#### B. Skills

- 1. will be able to identify the different types of track structures
- 2. will be able to design the horizontal and vertical alignment of the tramway route.
- 3. will be able to calculate and design track connections as well as select the proper turnout type
- 4. will be able to use the loading gauge and kinematic envelope concepts in the design of tramway lines integrated into an urban landscape
- 5. will be able to perform complex modeling tasks using CAD software,
- 6. will be able to represent his digital model with a graphic representation that complies with the standard,

#### C. Attitudes

- 1. cooperates with the tutor/lecturer and with fellow students, develops his/her co-working skills during the teamwork [HF1 Homework 1.]
- 2. continuously extends his/her knowledge.
- 3. develops precise problem-solving skills.

#### D. Autonomy and Responsibility

- 1. will be able to work autonomously and/or with individual research to complete his/her tasks.
- 2. is open to the comments and critics of teachers and fellow students.
- 3. co-operates with his/her fellow students.
- 4. is able to think in a total system.

## 2.3 Methods

Lectures with slides, seminars, case studies, self-made small projects,

#### 2.4 Course outline

Week Topics of lectures		
1.	The design process, phases: Feasibility study, Study	
	Plan, Construction Plan. Content and formal	
	requirements of plans	
2.	Elements and design of horizontal and vertical	
	alignment (straight sections, transition curve, circular	
	curve). Spatial coordination of horizontal and vertical	
	alignment. Self-explaining roads.	
	Elements of the cross-section: rural and urban roads.	
	Function and design. Facilities for pedestrians and	
	cyclists.	
4.	Traffic planning. At-grade intersections, elements of	
	intersections.	
5	Traffic regulation on rural roads; road signs and	

		pavement markings, tr	raffic lights.	
6.			tails of horizontal alignment elements: pavement	
			edge rounding, compound curves, parking lots, stops of	
		public transport service		
7.			urban roads: traffic calming,	
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			ough-passing sections, settlement	
0			1.1.	
8.			Introduction: Rail transport systems and their	
			aspects of railway route (center line	
			nment, structural and loading	
		gauge, distance between track axes). Track layout		
		guidelines, elements of the railway horizontal and		
		<u> </u>	vertical alignment;	
9.		Tramway route and line design I.: Railway		
			Alignment Optimization in Tramway, analytical	
		descriptions of · track	geometry variations (flexible	
		tramway track alignm	ent design, distance variation	
		-	vo tracks, comparison of multiple	
		alignments)		
10.			line design II.: Tramstop and	
	,		terminus Platforms layout design, track connections,	
			al principles, Organisation of	
		Space & Tasks)	ar principles, enganisation of	
1.       2.		Tramway Turnouts and crossings: standard turnout		
		forms, design parameters, geometry, structural		
		Components  Modern Transvey Treek Structures and its		
2.		Modern Tramway Track Structures and its		
		elements: conventional ballasted tracks, slab tracks,		
		I I	(Concepts and functionalities with	
	3.		mechanical-, / fastening based indirect-, / without Track	
			gauge control), green track solutions, construction and	
			maintenance technologies	
13.			Special railway systems in an urban area I: Cog	
		railways, Cableways, 1		
14.		Special railway systems in an urban area II:		
		monorail systems, and	l rubber-tired trams	
Content and formal requirements of plans. I.	Week		Topics of exercise classes	
	1.		Study plan. Orientation on the	
			map, forming neutral lines.	
	2.		Study plan. Elements and design	
			of the horizontal alignment.	
	3.		Study plan. Elements and design	
	[		of the vertical alignment.	
4.			Study plan. Elements and design	
			of the cross-section.	
	5.		Cross sections. Superelevation.	
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			Drainage. Horizontal curve with	
			symmetrical and asymmetrical	
			transition curves. Superelevation.	
			Superelevation runoff.	
	6.		Consultation - workshop	
	7.		Designing the horizontal	
			alignment of tramway tracks I.	
	8.		Designing the horizontal	

	alignment of tramway tracks II.
9.	Turnouts, track connection, and
	tramstop platform design
10.	Consultation - workshop
11.	Cross-section design: Integrating
	Tramway System into the Urban
	Landscape
12.	Content and formal requirements
	of plans. I.
13.	Content and formal requirements
	of plans. II.
14.	Consultation - workshop

The above programme is tentative and subject to changes due to calendar variations and other reasons specific to the actual semester. Consult the effective detailed course schedule of the course on the subject website.

### 2.5 Study materials

Lectures and slides.

### 2.6 Other information

Attendance of lectures is compulsory. The credits from the subject will be refused to students missing more than four times.

#### 2.7 Consultation

Teachers are available for consultation during their office hours, as advertised on the department website.

This Subject Datasheet is valid for:

#### II. Subject requirements

## Assessment and evaluation of the learning outcomes

#### 3.1 General rules

The assessment of the learning outcomes is specified in clause 2.2. above and the evaluation of student performance occurs via two midterm tests, two homework, and a written exam in the exam period.

#### 3.2 Assessment methods

Evaluation form	Abbreviation	Assessed learning outcomes
1. Midterm test	ZH1	
2. Midterm test	ZH2	A.1-A.2; B.1-B.4; C.2
1. Projectwork	HF1	C.1
2. Projectwork	HF2	A.1-A.4; B.1-B.6
Written exam	V	A.1-A.4; B.1-B.6; C.1-C.3; D.1-D.4

The dates of deadlines of assignments/homework can be found in the detailed course schedule on the subject's website.

#### 3.3 Evaluation system

Abbreviation	Score
HF1	15%
HF2	15%
ZH1	10%
ZH2	10%
V	50%
Sum	100%

### 3.4 Requirements and validity of signature

To be present at least 70% of the classes and seminars. The student must achieve a result of at least 50% (=performance threshold) separately for all performance evaluations carried out during the semester. submit the homework and receive a grade of at least pass of it.

### 3.5 Grading system

Grade	Points (P)
excellent (5)	P>87,5%
good (4)	75%<=P<87,5%
satisfactory (3)	62,5%<=P<75%
passed (2)	50%<=P<62,5%
failed (1)	P<50%

#### 3.6 Retake and repeat

- 1. The homework can be given with delay till a pre-defined date usually one week later by paying a fee.
- 2. The homework given in and accepted can be amended till the pre-defined deadline without paying a fee.
- 3. The two midterm tests can be repeated –without fee at a previously determined date given in the course schedule. One midterm test can be repeated twice by paying a previously defined fee.
- 4. The new result of the repeated test always overwrites the former results.

#### 3.7 Estimated workload

Activity	Hours/semester
contact hours	14×5=70
preparation for the projects	24
preparation for the tests	2×14=28
preparation for the exam	28
Sum	5x30=150

8 Effective date	
September 2022	
his Subject Datasheet is valid for:	