



UNDERGRADUATE STUDY: **TRANSPORT**

SEMESTER (II)

Syllabus

Academic year 2025/2026

Course: Road Infrastructure						
Head of course: Assoc. Prof. Luka Novačko , Ph. D.						
Co-lecturers: Karlo Babojelić , Ph. D.						
Semester: W	Course code: 283248	Lectures: 30	Auditory exercises: 0	Laboratory exercises: 30	Seminars: 0	ECTS credits: 5
Group for lectures: 15 students			Group for auditory and laboratory exercises: 15 students			

Objective of the course:

- To acquaint students with the stages of road design outside urban areas, from the study level in which the traffic projects are extremely important (traffic study), through the conceptual design of the road and implementation solutions that include equipment and road protection, to the user-use level that includes road maintenance and determination of the useful features of the road.

Course enrolment requirements:

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Learning outcomes:

1. Analyze operational features of the road.
2. Interpret the procedure for determining road design boundary elements.
3. Calculate horizontal and vertical road elements, capacity and level of service.
4. Design a conceptual layout of two-lane highway.
5. Construct Create the cross-section of the road by road type and terrain restrictions.
6. Select the road equipment and the roadside service facilities.
7. Compare the types of the roadside service facilities.



LECTURES, EXERCISES and SEMINARS

Week	Syllabus	Form of classes	Performed by	Lessons	Remark
1.	▪ Historical development of roads	L	Luka Novačko		
	▪ Defining roads, basic legal regulations, projects, and permits required for road construction, and road division. Design and calculation speed	LE	Karlo Babojelić		
2.	▪ Legal foundation, regulation and strategical documents for road design	L	Luka Novačko		
	▪ Introduction to cartography bases for road design	LE	Karlo Babojelić		
3.	▪ Basic terms and classification of roads	L	Luka Novačko		
	▪ Calculation of the road layout elements, principles of designing curves	LE	Karlo Babojelić		
4.	▪ Traffic indicators in road design	L	Luka Novačko		
	▪ Designing tangent lines using software tool	LE	Karlo Babojelić		
5.	▪ Level of service of motorways, multi-lane and two-lane highways	L	Luka Novačko		



	▪ Designing curves. Characteristics of a horizontal curves	LE	Karlo Babojelić		
6.	▪ Basic features of vehicle movement	L	Luka Novačko		
	▪ Longitudinal cross-section – terrain line	LE	Karlo Babojelić		
7.	▪ Horizontal alignment of highways – line and curves	L	Luka Novačko		
	▪ Longitudinal cross-section – geometric characteristics of vertical curves	LE	Karlo Babojelić		
8.	▪ Horizontal alignment of highways – spiral transition curves, sight distance on horizontal curves	L	Luka Novačko		
	▪ Designing longitudinal cross-section of a road using software tool	LE	Karlo Babojelić		
9.	▪ Vertical alignment of highways. Sight distance on vertical curves	L	Luka Novačko		
	▪ Superelevation – scheme, determining design values of superelevation	LE	Karlo Babojelić		
10.	▪ Cross-section elements. Traffic cross-section and full-road cross section	L	Luka Novačko		
	▪ Cross-section elements	LE	Karlo Babojelić		



11.	Basic principles of motorway planning and design	L	Luka Novačko		
	Widening of curve. Cross-section characteristics (cuts, kerf, and embankments)	LE	Karlo Babojelić		
12.	Specifics of planning and designing of urban roads	L	Luka Novačko		
	Design of the characteristic cross-section (cuts, kerf, and embankments) using software tool	LE	Karlo Babojelić		
13.	Superstructure and substructure of roads and drainage. A visit to the construction site of a new road or reconstruction of an existing road	L	Luka Novačko		
	Level of service calculation of the two-lane highway	LE	Karlo Babojelić		
14.	Road equipment and maintenance	L	Luka Novačko		
	Level of service calculation of the two-lane highway using software tool	LE	Karlo Babojelić		
15.	Road service facilities. Basics of road maintenance	L	Luka Novačko		
	Review and project defence	LE	Karlo Babojelić		

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



STUDENT OBLIGATIONS AND EXAMS

Conditions for obtaining signatures:

Students are required to attend lectures and laboratory exercises. In case of absence more than 3 times from lectures or more than 3 times from exercises, students lose the right to register for the exam. Also, in order to register for the exam, students must successfully defend the project. In the project students create a two-lane highway project. The project consists of the layout of the road in the scale M1:2000, the longitudinal cross-section of the road in M1:2000/200, the scheme of superelevation, the cross-section in M1:50 and three characteristic cross-sections in the embankment, kerf and cuts (M1:100) and level of service calculation. In the written part of the exam, students must achieve 60% of the total number of points for a positive evaluation and the possibility of joining the oral part of the exam. In the written part of the exam, the grades are distributed as follows: 60% - 70% - sufficient (2); 71% - 80% - good (3); 81% - 90% - very good (4); 91% - 100% - excellent (5). The oral part of the exam is mandatory for all students.

Written Examination: A student who successfully defends their seminar is eligible to participate in the written examination. The exam will assess the student's understanding of key concepts covered throughout the course, including theoretical knowledge and practical applications. To pass the examination, a student must achieve at least 60% of the total possible points. The exam aims to evaluate the student's comprehension, critical thinking, and ability to apply learned principles effectively.

Oral examination: Students who successfully pass the final written examination, in accordance with the examination schedule, will be granted access to the oral part of the examination. The oral examination serves as an opportunity for students to demonstrate their deeper understanding of the course material, articulate key concepts, and engage in analytical discussions.

The exact date and time for the oral examination will be announced along with the results of the final written examination through the Merlin system. Students are advised to check the system regularly for updates and ensure they are prepared for this final stage of assessment.

LITERATURE

a) Obligatory literature:

1. Novačko L.; Babojelić K.: *Road Infrastructure. Authorized lectures – presentations*. Faculty of Transport and Traffic sciences, University of Zagreb. Zagreb, 2025. (Available at: merlin.srce.hr)

b) Recommended literature:

1. Legac I. Cestovne prometnice I – javne ceste, Fakultet prometnih znanosti, Zagreb, 2006
2. Novačko L. Cestovne prometnice I - skripta za izradu seminarskog rada, Fakultet prometnih znanosti, Zagreb, 2016.
3. Pravilnik o osnovnim uvjetima kojima javne ceste izvan naselja i njihovi elementi moraju udovoljavati sa stajališta sigurnosti prometa, Narodne novine 110/01
4. Highway Capacity Manual (HCM), 7th Edition (2022) – Transportation Research Board (TRB)



METHODOLOGY OF THE IMPLEMENTATION OF THE COURSE PLAN

Knowledge of the English language is a prerequisite for this course

1. LECTURES

Lectures are typically conducted using PowerPoint presentations and blackboards, with video materials incorporated into certain sessions. In some lessons, multimedia tools and internet resources may also be utilized. Students are encouraged to actively engage in the lectures by working on assigned materials, preparing in advance for class discussions, and contributing to topic-related discussions. Lecture slides, provided in PDF format, are accessible to students through the **Merlin system** (moodle.srce.hr/yyyy-yyyy or merlin.srce.hr).

2. LABORATORY EXERCISES

During the laboratory exercises, students will apply theoretical knowledge to practical road design using **AutoCAD** and **Plateia software**. These exercises will focus on the key aspects of road design, including:

- **Plan View Design** – Developing the horizontal alignment of the road, incorporating curves, intersections, and right-of-way considerations.
- **Vertical Alignment Design** – Creating the longitudinal profile of the road, including slopes, gradients, and elevation changes to ensure proper drainage and driving comfort.
- **Cross-Section Design** – Defining the road's structural components, such as lanes, shoulders, sidewalks, and drainage elements, while considering terrain constraints.

At the end of the laboratory exercises, students will print their designed road as project documentation. Additionally, they will be required to defend their seminar, demonstrating their understanding of the design process and justifying their technical decisions. Through these exercises, students will gain hands-on experience in digital road design, learning industry-standard techniques and software tools to develop road infrastructure projects efficiently.

Note: Individual and/or group viewing negative written test

Individual inspection of the negative written examination is possible after each written examination in the office hour of the teacher (the teacher who conducted the examinations) or in the period provided for this purpose, which is published with the results of the written examination.



3. DOCUMENTATION

The course is continuously monitored through **electronic attendance tracking** for lectures, exercises, and colloquiums via the **SAN system** (*Sustav Autorizacije i Nadzora*). Students must register their attendance by swiping their **student ID card (iksica)** through the designated device. It is mandatory for students to carry their student ID during both lessons and examinations.

The grades for the **written examination** and the **final course grade** are recorded in the **ISVU system**.

All **important course announcements**, including **colloquium and exam results, oral examination dates, and other notifications**, are published through the **Merlin system** (*moodle.srce.hr/yyyy-yyyy* or *merlin.srce.hr*).

4. SCORING SYSTEM

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

no	Segment:	Required credits to be achieved:		Remark:	ECTS credits
		Min.	Max.		
1.	Presence at the lectures	5	5	Students are required to attend lectures and laboratory exercises. In case of absence more than 3 times from lectures or more than 3 times from exercises, students lose the right to register for the exam.	1
2.	Presence at the exercises (laboratory)	5	5		1
3.	Seminar	20	50	Students must successfully defend the seminar	1,5
4.	Written exam	60	100	Students must achieve min. 60% on written final exam.	1
5.	Oral exam	20	50	Oral exam is obligatory and students can gain between 20 and 50 points	0,5
Σ	Overall points:	110	210	Overall ECTS points:	5

*During the course the student is evaluated based on the sum of the internal points earned through participating in class (lectures and exercises) and grading the seminar work. The student, in order to realize the condition "courses requirements achieved", must achieve a minimum of 30 points.



Table 2 - Explanation of the credit values in evaluations

CREDITS:	Estimate based on attendance, seminar paper and written exam - [4,5 ECTS]*:	The final score [5 ECTS]*:
110-126	Sufficient (2)	The final grade after oral exam
127 - 168	Good (3)	
169 - 189	Very good (4)	
190 - 210	Excellent (5)	

Information for students (scoring system, implementation plan, learning outcomes, syllabus, literature, consulting teachers, announcement of results of examinations or colloquium, and all other information):

- <https://moodle.srce.hr/2025-2026/> (<https://merlin.srce.hr>)
- <http://www.fpz.unizg.hr/isvu/2025-en/>

Student assistants:

Additional individual work with students through one-on-one consultations for assignments from the seminar paper, as well as to review the negative written portion of the written exam or colloquium.