



GRADUATE STUDY: TRANSPORT

SEMESTER (I/II)

Syllabus

Academic year 2024/2025

Course: Road Traffic Signalling and Equipment					
Head of course: Prof. Darko Babić , Ph.D.					
Co-lecturers: Asst. Prof. Dario Babić , Ph.D. Mario Fiolić , Ph.D. Ivana Kučina , mag. ing. traff.					
Semester: W/S	Course code: 60634	Lectures: 30	Auditory exercises: 30	Laboratory exercises: 0	ECTS credits: 6
Group for lectures: students			Group for auditory and laboratory exercises: students		

Objective of the course:

- To obtain an understanding of the principles, concepts, and practices used for the design of road traffic signalling
- To understand the impact of road traffic signalling on driver's behaviour and overall road safety
- Train students to think critically in terms of the choice and design of road traffic signalling elements
- Understand the importance of road traffic signalling for automated and autonomous vehicles

Learning outcomes:

- Define the basic terms related to the road traffic signalling and describe the main characteristics of road traffic signals
- Describe materials used for road traffic signalling elements
- Apply the acquired knowledge in the development of road traffic projects
- Analyse the results of quality testing of the traffic signalling elements, and compare the results with current regulations and standards.
- Determine operational and safety effects of road traffic signalling elements



**LECTURES and AUDITORY EXERCISES**

Week	Syllabus	Form of classes	Performed by	Lessons	Remark
1.	<ul style="list-style-type: none"> • Keynote lecture • Introduction to the course content, readings, flow diagram for the successful passage through the course • Basic concepts 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • Introduction of the content of Seminar 	AE	Dario Babić	2	
2.	<ul style="list-style-type: none"> • Introduction to road traffic signalling • Basic forms of visual traffic messages and warnings • Road traffic information graphics 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • Basic concepts of road traffic signalling 	AE	Dario Babić	2	
3.	<ul style="list-style-type: none"> • Types of reflection in nature and their influence in road traffic • Retroreflection and road traffic signalling 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • Reflection and retroreflection, examples and tasks 	AE	Mario Fiočić	2	
4.	<ul style="list-style-type: none"> • Perception of traffic signalling in conditions of reduced visibility <ul style="list-style-type: none"> • Atmospheric problems • Vehicle problems • Problems caused by the driver 	L	Darko Babić	4	
	<ul style="list-style-type: none"> • Night-time visibility and perception of traffic signalling elements 	AE	Mario Fiočić	2	
5.	<ul style="list-style-type: none"> • Definition and types of traffic signalling elements 	L	Dario Babić	2	



	<ul style="list-style-type: none"> • Overview of international standards, guidelines and norms related to traffic signalling 	AE	Dario Babić	2	
6.	<ul style="list-style-type: none"> • Road signs <ul style="list-style-type: none"> • Basic concepts of road signs • Road sign perception process • Placing road signs 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • International practices related to road signs 	AE	Mario Fiolčić	2	
7.	<ul style="list-style-type: none"> • Retroreflective materials • Comparison of material characteristics 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • Types of retroreflective materials <ul style="list-style-type: none"> • Class I material • Class II material • Class III material 	AE	Dario Babić	2	
8.	<ul style="list-style-type: none"> • Road markings • Types of materials for making pavements 	L	Darko Babić	4	
	<ul style="list-style-type: none"> • International practices related to road markings 	AE	Dario Babić	2	
9.	<ul style="list-style-type: none"> • Quality testing of road signs 	L	Darko Babić	2	
	<ul style="list-style-type: none"> • Methods, norms, procedures, “good” practices 	AE	Mario Fiolčić	3	
10.	<ul style="list-style-type: none"> • Quality testing of road markings 	L	Dario Babić	2	
	<ul style="list-style-type: none"> • Methods, norms, procedures, “good” practices 	AE	Mario Fiolčić	3	



11.	<ul style="list-style-type: none">• Traffic equipment on roads<ul style="list-style-type: none">• Definition of traffic equipment• The role of transport equipment	L	Darko Babić	2	
	<ul style="list-style-type: none">• International practices related to road equipment	AE	Mario Fiočić	2	
12.	<ul style="list-style-type: none">• Road signaling and traffic calming strategies	L	Darko Babić	2	
	<ul style="list-style-type: none">• Types of traffic calming equipment, examples and experiences• Road traffic signalling for vulnerable users, examples and experiences	AE	Dario Babić	2	
13.	<ul style="list-style-type: none">• Influence of road traffic signalling on automated and autonomous vehicles	L	Darko Babić	2	
	<ul style="list-style-type: none">• Overview of currently used ADAS systems• Future of road traffic signalling	AE	Dario Babić	2	

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



STUDENT OBLIGATIONS AND EXAMS

Conditions for obtaining signatures:

In order to gain the right to signature, the student should attend at least 80% of the lectures and 80% of the exercises.

Written exam:

Written is carried out in two ways:

a) **in two parts, through two colloquia:** the first colloquium is held halfway through the semester and the other at the end of the semester. The first colloquium can be accessed by all students who are attending classes (min 80%), and the second only students who have passed the first colloquium.

b) **in one part through a written final exam:** all those students who did not pass both exams or who want to increase the grade are on the written part of the exam.

Oral exam: In order to attend oral exam, students have to have aforementioned minimum attendance on lectures and auditory exercises and successfully passed both the colloquia or the written final exam.

LITERATURE

a) Obligatory literature:

- Scukanec, A. *Signaling and equipment in road traffic*. Faculty of Transport and Traffic Sciences, University of Zagreb, 2022.
- Evaluation of road projects - Authorized lectures, 2018.

b) Recommended literature:

- Olson, P. L., Dewar, R., Farber, E.: *Forensic Aspects of Driver Perception and Response*, Tuscon, 2010.
- Highway Safety Manual, 2010.
- Castro, C. & Horberry, T. *The human factor of transport signs*, 2004.
- Castro, C. *Human factors of visual and cognitive performance in driving*, 2009.
- AASHTO. *A policy on geometric design of highways and streets*, 2011.
- Olson, P. L., Dewar, R. & Farber, E. *Forensic aspects of driver perception and response: Third edition*, 2010.





METHODOLOGY OF THE IMPLEMENTATION OF THE COURSE PLAN

1. LECTURES

Lectures follow the material presented in authorized lectures (presentations and scripts) listed in the required literature, and are mostly performed using Power Point presentations and boards. Video presentations are used for some units. Students are encouraged to study the publication of teaching materials as well as other literature before the lecture so that they can actively participate in the discussion on the issues being taught.

2. AUDITORIAL EXERCISES AND SEMINAR

Auditorial exercises are performed in such a way that "case-study" examples are presented in order for students to understand the issue and international procedures and practices related to road traffic signalling.

Note: Individual and/or group viewing negative written test

Individual at the time of consultation or a designated period after each colloquium and / or written exam.

3. DOCUMENTATION

Records of attendance in lectures and exercises and success of colloquia results are conducted through the Merlin system e-learning system, which also allows for permanent archiving.

4. SCORING SYSTEM

A total of 20 points are needed to achieve the goal of "right to sign" and set the status of "course attended". Exemption from the written exam: minimum achieved 40 points through colloquium 1 and 2. With a minimum of 61 points, the student can access the oral part of the exam. The written part of the exam can amount to a maximum of 80 points.

The overall scoring system is presented in the Table 1.



**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 in lectures	10	10	Presence \geq 80%	1
2.	Presence in auditory exercises	10	10	Presence \geq 80%	1
4.	Colloquies (written 2x per semester)	21	40		2
5.	Written exam	21	40	<i>Replacement item 4.</i>	
Σ		61	100		6

The final grade is formed on the basis of the sum of points achieved in the written and oral part of the exam.

Table 2 - Explanation of the credit values in evaluations

CREDITS:	Estimate based on attendance and two colloquies (or written exam) - [4 ECTS]:	The final score [6 ECTS]:
61 - 70	Sufficient (2)	The final score after oral exam
71 - 80	Good (3)	
81 - 90	Very good (4)	
91 - 100	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/2020-2021/>
- <http://www.fpz.unizg.hr>

Student assistants: Additional individual work with the students through individual consultations for assignments from auditory exercises for optional homework, as well as for insight into the negatively written part of the exam.

