Department of Intelligent Transport Systems
Chair of Applied Computing

UNIVERSITY OF ZAGREB
FACULTY OF TRANSPORT AND TRAFFIC SCIENCES

UNDERGRADUATE STUDY: TRANSPORT

SEMESTER (IV)

Syllabus

Academic year 2025/2026

Course:	**Transport and Traffic Data Analytics**					
Head of course: Prof. **Tonči Carić**, Ph.D.						
Co-lecturers:	Asst. Prof. **Martin Gregurić**, Ph.D. **Martina Erdelić**, Ph.D. **Mladen Miletić,** MSc Traff. Eng					
Semester: **S**	Course code:	Lectures: **30**	Auditory exercises: **0**	Laboratory exercises: **0**	Seminars: **30**	ECTS credits: **5**
Group for lectures: **15 students**			Group for auditory and laboratory exercises: **15 students**			

Objective of the course:

- Teach students for critical analysis of problems in the domain of traffic and transport technology, and recognition of similarity, irregularities and patterns in data using known scientific approaches from the area of big data analytics with the use of software tools for solving those problems.

Course enrolment requirements:

- No enrolment requirements for this course. However, prior knowledge of basic programming concepts are beneficial.

Learning outcomes:

1. Analyse the characteristics of data collected from a traffic network
2. Evaluate the advantages of presentation of data with spatial component
3. Analyse historical and real-time traffic datasets
4. Asses the results of similarity analysis, pattern recognition, and identified irregularities in traffic data
5. Identify the knowledge from nonstructured traffic datasets
6. Recommend the solution to a given problem from the domain of transport and traffic technology using data analytics

LECTURES, EXERCISES and SEMINARS

Week	Syllabus	Form of classes	Performed by	Lessons	Remark
1.	▪ Fundamentals of statistical analysis	L	Tonči Carić	2	
	▪ Calculation of descriptive statistical values on a traffic dataset	S	M. Erdelić, M. Miletić	2	
2.	▪ Distributions of traffic data and confidence interval	L	Tonči Carić	2	
	▪ Visualisation of different data distributions on selected traffic datasets	S	M. Erdelić, M. Miletić	2	
3.	▪ Collection, exploration and description of traffic data	L	Tonči Carić	2	
	▪ Implementation of cleaning and filtering methods of traffic datasets	S	M. Erdelić, M. Miletić	2	
4.	▪ Visualization of traffic data	L	Tonči Carić	2	
	▪ Graphical visualisation of traffic dataset contents	S	M. Erdelić, M. Miletić	2	
5.	▪ Correlation measures between variables and feature selection methods	L	Tonči Carić	2	

	▪ Calculation of correlation and ANOVA F values for a given traffic feature	S	M. Erdelić, M. Miletić	2	
6.	▪ Methods for dimensionality reduction in big traffic datasets	L	Tonči Carić	2	
	▪ Application of PCA method for dimensionality reduction of traffic data	S	M. Erdelić, M. Miletić	2	
7.	▪ Similarity analysis in traffic data	L	Tonči Carić	2	
	▪ Distance calculation (Euclidean, Mahalanobis, Cosine, Jaccard) for similarity presentation between two user trajectories	S	M. Erdelić, M. Miletić	2	
8.	▪ Methods for pattern and irregularity identification in traffic data	L	Tonči Carić	2	
	▪ Use of graph based method for finding irregularities in spatial data	S	M. Erdelić, M. Miletić	2	
9.	▪ Analysis of traffic data using association method	L	Tonči Carić	2	
	▪ Application of A-priori algorithms for coincidence detection in user travel data	S	M. Erdelić, M. Miletić	2	
10.	▪ Methods for data discretization	L	Tonči Carić	2	
	▪ Implementation of data discretization method using equal width, equal frequency, and k-means algorithm.	S	M. Erdelić, M. Miletić	2	

11.	▪ Analysis of temporal sequences in traffic data	L	Tonči Carić	2	
	▪ Decomposition of datasets with the goal of sesonality and trend detections in traffic data	S	M. Erdelić, M. Miletić	2	
12.	▪ Analysis of real time data	L	Tonči Carić	2	
	▪ Use of interfaces for visualisation of real-time traffic data	S	M. Erdelić, M. Miletić	2	
13.	▪ Analysis of nonstructured traffic datasets	L	Tonči Carić	2	
	▪ Examples of traffic data analytics	S	M. Erdelić, M. Miletić	2	
14.	▪ Cluster identification in graph based traffic datasets	L	Tonči Carić	2	
	▪ Identification of traffic network nodes which are mutually connected more than other nodes	S	M. Erdelić, M. Miletić	2	
15.	▪ Analysis of systems using business intelligence methods	L	Tonči Carić	2	
	▪ 15. Use of business intelligence tools for visualisation and data processing	S	M. Erdelić, M. Miletić	2	

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 exercises, with a mandatory attendance of 70% for both lectures and exercises. Throughout the semester, students are required to solve two problem tasks and complete a project task, which must be successfully defended at the end of the semester. Knowledge assessment is conducted on a computer through the completion of an individual project task and two problem tasks. Each task is graded by the instructor with a maximum of 25 points. The project task consists of two phases. By completing and orally defending the first and second phases of the project task, a maximum of 100 points can be obtained. The proposed grade is generated based on the following point scale: 90-104.99 points (pass (2)); 105-119.99 points (good (3)); 120-134.99 points (very good (4)); 135-150 points (excellent (5)).

LITERATURE

a) Obligatory literature:

1. Chowdhury M, Apon A, Dey K, Data Analytics for Intelligent Transportation Systems. Elsevier; 2017.
2. Wes M, Python for Data Analysis. O'Reilly Media. 2012.

b) Recommended literature:

1. Han J, Jian P, Hanghang T, Data mining: concepts and techniques. Morgan Kaufmann; 2022.

METHODOLOGY OF THE IMPLEMENTATION OF THE COURSE PLAN

1. LECTURES

Lectures follow the material presented in authorized presentations listed in the required literature and are mainly conducted using PowerPoint presentations and a board. Discussions on the presented topics are encouraged during the lectures.

2. AUDITORY EXERCISES

No auditory exercises.

3. LABORATORY EXERCISES

No laboratory exercises.

4. SEMINAR

Seminars exercises are conducted in a PC classroom. The tools used include Visual Studio Code and Python. Exercises are carried out based on pre-prepared tasks and datasets.

Note: Individual and/or group viewing negative written test

5. DOCUMENTATION

Attendance is recorded for lectures, tutorial exercises, and successfully completed seminar exercises.

6. 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		70 %	100 %		**1**
2.	Presence at the exercises (auditory and laboratory)		-	-		**0**
3.	Seminar		70 %	100 /		**1**
4.	Project	= Written exam	0	50		**1**
5.	Hands-on Data Analytics exam		0	50		**2**
6.	Oral exam		0	50		**1**
Σ	*Overall points:*		0	150	*Overall ECTS points:*	**6**

Table 2 - Explanation of the credit values in evaluations

CREDITS:	Estimate based on attendance, seminar paper and two colloquies (or written exam) - [4 ECTS]*:	The final score [5 ECTS]*:
90-104	Sufficient (2)	
105-119	Good (3)	
120-134	Very good (4)	
135-150	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: