General information		
Course leader	**PhD Alberto Teković, University College Professor**	
Course title	**Wireless Computer Networks 1**	
Study programme		
Course status	Mandatory	
Year	Year 1, semester 2	
Number of credits and mode of teaching delivery	ECTS student workload coefficient	4
	Number of hours (L+E+S)	60 (30 P + 30 V + 0 S)

COURSE DESCRIPTION

1.1. Course objectives

Learn the theoretical foundations of signal transmission at the air interface. Learn the basics of WAN communication networks. Use WAN communication networks to solve IoT problems.

1.2. Conditions for enrolment in the course

No formal conditions. Student should be able to write programs comfortably in any object-oriented programming language.

1.3. Expected learning outcomes of the course

- **LO1 - Determine the effects of the principle of signal transmission on the air interface.**
- **LO2 - Estimate the propagation of electromagnetic radiation based on carrier frequency, signal strength and environmental characteristics.**
- **LO3 - Compare the architecture, basic concepts and characteristics of WAN systems 2G, 3G, 4G and 5G.**
- **LO4 - Measure the coverage and quality of service, and calculate the capacity in the WAN communication network.**
- **LO5 - Create your own software solution using an embedded computer and modem for a WAN communication network.**

1.4. Course content

Electromagnetic radiation.
Electromagnetic wave and polarization.
Frequency bands.
Air interface power: dB, dBm, dBi.
Principles of radio signal propagation: losses, reflection, refraction, diffraction, scattering on a rough surface.
Multiple access methods: FDMA, TDMA, CDMA, SDMA, OFDMA, SC-FDMA, CSMA-CD.
Modulations: analog and digital.
Radio signal transmission techniques.
Antennas.

Elements of GSM system architecture: mobile station, base station system, exchange system, control and maintenance center.
GSM system features: cellular principle, handover, system capacity.
2G, 3G, 4G, 5G elements: GSM, GPRS, EDGE, UMTS, HSDPA, HSUPA, HSPA +, LTE, LTE Advanced, 5GNR, 5G SA
Using 2G, 3G, 4G, 5G modems on the embedded platform using AT commands.

1.5. Teaching delivery modes:	☒ lectures ☐ seminars and workshops ☒ exercises ☐ remote learning ☐ field work	☒ independent work ☐ multimedia and network ☒ laboratory ☒ mentoring ☐ other _____
1.6. Comments		

1.7. Student obligations

STUDENT ATTENDANCE

Class attendance is mandatory in the percentage prescribed by the Studies and examination regulations.

PASSING THE EXAM

The course has defined learning outcomes. In order for a student to pass the course, he/she must achieve a minimum of 50% of the points available for each learning outcome and collect a minimum of 50.01 points out of a possible 100 points per course.

1.8. Monitoring[1] student work

Class attendance		Activity during class		Seminar paper		Experimental work	
Written exam		Oral exam		Essay		Research	
Project	100%	Continuous assessment of knowledge		Student report		Practical work	
Portfolio		Homework					

1.9. Assessment and evaluation of student work during classes and the final exam

A grading system based is on a credit accumulation model combined with a defined sub-model, providing a model of the grading method and checking the satisfaction of learning outcomes used in this course.

CONCRETE REVIEW OF EVALUATION METHODS

The maximum number of points that a student can earn in a course is 100. Grades are

[1] IMPORTANT NOTES: Next to each method of monitoring student work it is necessary to insert an adequate share of each activity in ECTS credits, so the total number of ECTS credits corresponds to the credit value of the course. You can use empty fields for additional activities.

calculated according to the following criteria table within which the distribution of passing grades in terms of the number of points is applied.

Points	Grade
0,00 - 50,00	(1) unsatisfactory
50,01 - 58,00	(2) sufficient
58,01 - 75,00	(3) good
75,01 - 92,00	(4) very good
92,01 - 100,00	(5) excellent

The method of accumulating points is determined in this course in accordance with the elements of scoring as follows:

Criterion	Maximum points
Project	100
TOTAL	100

The way of taking the colloquiums, the learning outcomes it covers, as well as the implementation of exams and remedial exams are defined by the "Instructions for attending and taking the course".

1.10. Required reading (at the moment of submitting the joint study programme report)

- **Perry Lea: Internet of Things for Architects: Architecting IoT solutions by implementing sensors, communication infrastructure, edge computing, analytics, and security, Packt Publishing (January 22, 2018)**

1.11. Additional reading (at the moment of submitting the joint study programme report)

1.12. Number of copies of required reading in relation to the number of students who currently attend a course

Title	*Number of copies*	*Number of students*

1.13. Methods of quality monitoring that ensure the acquisition of knowledge, skills and competencies.

Monitoring the fulfilment of the desired learning outcomes is an important element of assessment because learning outcomes are the "guarantees" that the school gives to students, but also to employers and the wider community. Learning outcomes represent

the minimum threshold that each student must achieve in order to pass the course. For a passing grade, the student must satisfy all the learning outcomes with the demonstrated knowledge, which corresponds to 50% of the points achieved for each learning outcome. The method of scoring based on learning outcomes is presented in the document "Instructions for attending and taking the course".