Study programme(s): Applied Mathematics (MAP)

Course title: INTERNET OF THINGS (P112)

Lecturer(s): Djordje Herceg

Course status: elective

ECTS points: 5

Requirements: Programming 1

Learning Objectives

Acquiring the knowledge and skills needed to create a hardware prototype of IoT devices, programming and connecting them to Cloud services. Application of IoT devices to data collection, direct and remote control.

Learning Outcomes

Minimal: Students are expected to be able to assemble a model of an IoT device on their own, write a software for its management and communication with Cloud services.

Desirable: Students are expected to be able to recognize, analyze and fit complex requirements, design an IoT device and write the appropriate software for it, then design and develop a functional prototype of the IoT device by analyzing its functionality and troubleshooting the occurring errors during the development process. Students are also expected to create technical documentation for the hardware and software created. Student should be capable of teamwork with the use of online tools for cooperation and monitoring the implementation of the project.

Syllabus

Theoretical instructions: IoT device architecture. Components and assemblies for IoT devices. C++ programming for IoT. Data types, control structures, data structures. Memory management. Preprocessing directives. Object oriented programming. Timers, interrupts and threads. Input and output management. Access to shared resources. Real-time applications, acquisition and processing of real-world data. Communication channels and protocols. Working with Cloud IoT services. Creating documentation.

Practical instructions: Practical instructions follow the theoretical lectures. Topics from the lectures are practically covered by students assembling a model of the device and implementing certain segments of the software.

Practical exam: Students are developing a hardware-software project, which involves assembling a functional model and software for an IoT device as well as writing documentation.

Literature

1. Kuriawan, A., **Internet of Things Projects with ESP32**, Packt, 2019.
2. Borycki, D., **Programming for the Internet of Things**, Microsoft Press, 2017.
3. Schwarz, M., **Internet of Things with Arduino**, Packt, 2016.

Number of active classes	**Lectures: 2**	**Exercises: 2**

Teaching methods

Lectures and exercises are conducted in a computer classroom, using online collaboration tools and hardware models of IoT devices. Students' knowledge is tested on practical tasks during exercises, as well

as on the final exam, which is realized by working on a mini-project. The practical project is performed individually or in group work.			
Grading (maximum number of points 100)			
Pre-exam obligations	Points	**Final exam**	Points
Practical classes	**70**	Project Presentation	**30**