COURSE DESCRIPTION CARD – SPECIMEN

<table>
<tr><td colspan="10">Faculty of Electrical Engineering</td></tr>
<tr><td>Field of study</td><td colspan="6">Electrical and Electronics Engineering</td><td>Degree level and programme type</td><td>bachelor's degree, full time programme</td></tr>
<tr><td>Specialization/ diploma path</td><td colspan="6">-</td><td>Study profile</td><td>-</td></tr>
<tr><td rowspan="2">Course name</td><td colspan="6" rowspan="2">Fundamentals of Real-Time Operating Systems</td><td>Course code</td><td>IS-FEE-10076S</td></tr>
<tr><td>Course type</td><td>elective</td></tr>
<tr><td rowspan="2">Forms and number of hours of tuition</td><td>L</td><td>C</td><td>LC</td><td>P</td><td>SW</td><td>FW</td><td>S</td><td>Semester</td><td>summer</td></tr>
<tr><td>15</td><td></td><td>15</td><td></td><td></td><td></td><td></td><td>No. of ECTS credits</td><td>3</td></tr>
<tr><td>Entry requirements</td><td colspan="9">-</td></tr>
<tr><td>Course objectives</td><td colspan="9">Students acquire knowledge on the architecture and basic functional components of a selected real-time operating systems (RTOS). Students develop the theoretical and practical knowledge on preparing and testing of applications that communicate in real time using a physical microprocessor-based system.</td></tr>
<tr><td>Course content</td><td colspan="9"><u>Lecture:</u> The operating system - tasks, architecture, basic work mechanisms. POSIX standard. Architecture of real-time operating systems: system kernel, process and task management, synchronization and inter-task communication, alarms, interrupts.

<u>Laboratory classes:</u> Basics of creating applications in an integrated software environment working under RTOS control. Multithreaded applications for the selected microcontroller. Creating connection channels (Telnet protocol, static www server) for microprocessor-based system. Interprocess communication. Priorities, methods and algorithms for scheduling.</td></tr>
<tr><td>Teaching methods</td><td colspan="9">lecture, presentation, practical work in laboratory, small group discussion</td></tr>
<tr><td>Assessment method</td><td colspan="9">lecture – written exam, laboratory class – set of exercises</td></tr>
<tr><td>Symbol of learning outcome</td><td colspan="7">Learning outcomes</td><td colspan="2">Reference to the learning outcomes for the field of study</td></tr>
<tr><td>LO1</td><td colspan="7">Defines a real-time operating system and its properties.</td><td colspan="2"></td></tr>
<tr><td>LO2</td><td colspan="7">Specifies the basic components of a real-time operating system and the rules of their interoperation.</td><td colspan="2"></td></tr>
<tr><td>LO3</td><td colspan="7">Describes the features and implementation solutions of selected commercial real-time operating systems, knows examples of such systems</td><td colspan="2"></td></tr>
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LO4	Creates algorithms for the implementation of real-time control tasks in selected programming techniques.	
LO5	Can create and test an application running in real time.	
LO6	Can configure the system for cooperation with real-time automation device.	
Symbol of learning outcome	Methods of assessing the learning outcomes	Type of tuition during which the outcome is assessed
LO1	written test on lecture content	L
LO2	written test on lecture content	L
LO3	written test on lecture content	L
LO4	evaluation of the report on exercise	LC
LO5	evaluation of the report on exercise	LC
LO6	evaluation of the report on exercise	LC
Student workload (in hours)		No. of hours
Calculation	lecture attendance	15
	participation in laboratory classes	15
	preparation for laboratory classes	10
	working on reports	10
	participation in student-teacher sessions related to the laboratory classes	5
	preparation for and participation in exam	20
	TOTAL:	75

Quantitative indicators	HOURS	No. of ECTS credits
Student workload – activities that require direct teacher participation	37	1.5
Student workload – practical activities	40	1.5

Basic references	1. Liu Jane W. S., Real-time systems, New York, Prentice Hall, 2000. 2. Stallings W.: Operating systems: internals and design principless, Boston: Pearson, 2012. 3. Tanenbaum A.S.: Modern operating systems. Boston: Pearson Education, 2015. 4. Walls C.: Building a Real Time Operating System. Elsevier Science & Technology, 2019. 5. Wang, K.C. Embedded and Real-Time Operating Systems, Springer, 2017. 6. Wang J.: Real-Time Embedded Systems, Wiley, 2017.
Supplementary references	1. Siewert S., Pratt J.: Real-Time embedded components and systems with Linux and RTOS. Ingles, 2016. 2. QNX NeutrinoR RTOS. User's Guide For QNX Neutrino 6.5.0; Photon microGUI Programmer's Guide For QNXR NeutrinoR 6.5.0 QNX Software Systems, 2010.

Organisational unit conducting the course	Department of Automatic Control and Robotics	Date of issuing the programme
Author of the programme	Rafał Kociszewski, PhD Eng.	25.02.2021

L – lecture, C – classes, LC – laboratory classes, P – project, SW – specialization workshop, FW - field work, S – seminar