COURSE UNIT (MODULE) DESCRIPTION

Course unit (module) title	Code
Embedded system programming	

Academic staff	Core academic unit(s)
Coordinating: Assoc. prof. dr. Gintautas Daunys **Other:**	Siauliai Academy

Study cycle	Type of the course unit
First cycle studies	Compulsory

Mode of delivery	Semester or period when it is delivered	Language of instruction
Face-to-face or blended learning	6 semester	English

Requisites	
Prerequisites: Programming Languages, Computer Architecture	**Co-requisites (if relevant):**

Number of ECTS credits allocated	Student's workload (total)	Contact hours	Individual work
5	133	56	77

Purpose of the course unit		
To develop the abilities to create software for embedded systems based on microcontrollers, DSP, FPGA devices.		
Learning outcomes of the course unit	**Teaching and learning methods**	**Assessment methods**
Conprehend the principles of creating and analyzing algorithms for embedded systems, programming paradigms, languages and technologies	Traditional lectures, assignments	Exam, defense of assignments reports
Able to select appropriate tools for developing and maintaining embedded systems software	Traditional lecture, interactive lectures, assignments, sources analysis	Exam, defense of assignments reports
Able to implement embedded systems software product according to functional and non-functional requirements	Traditional lecture, interactive lectures, assignments, sources analysis	Defense of assignments reports
Able to demonstrate creativity in solving tasks and problems of professional activity	Assignments, prototype analysis, sources analysis	Defense of assignments reports

Content	Contact hours							Individual work: time and assignments	
	Lectures	Tutorials	Seminars	Workshops	Laboratory work	Internship	**Contact hours, total**	**Individual work**	**Tasks for individual work**
1. Applications of embedded system	2				0		**2**	**2**	Individual reading.
2. Microcontrollers	6				8		**14**	**16**	Individual reading, micro-controller programming.
3. Converters	4				4		**8**	**4**	Literature search, individual reading, micro-controller programming.
4. Microcontrollers	4				4		**8**	**8**	Individual reading, micro-controller programming.
5. Microcontrollers communications	4				8		**12**	**12**	Individual reading micro-controller programming.
6. Digital signal processors	2				0		**2**	**4**	Individual reading.
7. Field programmable gate arrays	2				0		**2**	**8**	Individual reading.
8. Hardware defition languages	3				4		**7**	**6**	Individual reading and programming in Verilog.
9. Development of systems with FPGA	1				0		**1**	**2**	Individual reading.
10. Preparation for exam								**15**	Individual reading.
Total	**28**				**28**		**56**	**77**	

Assessment strategy	Weight %	Deadline	Assessment criteria
1. Programming assignments for topic 2	15%	Week 6	Assessment by grade in 10 point system. Grade depends on: efficiency of code, completeness of performed tests, clarity of description and quality of conclusions. All assignments are obligatory. The cumulative score is calculated only when all interim assignments have been evaluated.
2. Programming assignments for topics 3-4	15%	Week 10	
3. Programming assignments for topic 5	10%	Week 12	
4. Programming assignments for topic 8	10 %	Week14	
5. Exam	50 %	Exams session	Test with 10 open-ended questions. The value of each question is 1 point.

Author (-s)	Publishing year	Title	Issue of a periodical or volume of a publication	Publishing house or web link
Required reading				
Ünsalan, C., Gürhan, H.D., Yücel, M.E.:	2022	Embedded System Design with ARM Cortex-M Microcontrollers: Applications with C and MicroPython		Springer Nature, London
Taraate V.	2022	Digital Logic Design Using Verilog: Coding and RTL Synthesis		Springer Nature, London

Recommended reading				
Marwedel P.	2021	Embedded System Design: Embedded Systems Foundations of Cyber-Physical Systems, and the Internet of Things		Springer
Vermesan O.	2018	Advancing IoT Platforms Interoperability		River Publishers
Dogan I.	2019	ARM-Based microcontroller projects using MBED		Newnes