RTU Course "Introduction to Digital Electronics"

33000 Faculty of Computer Science, Information Technology and Energy

General data

Code	EEI505
Course title	Introduction to Digital Electronics
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Ilja Galkins
Academic staff	Lauris Bisenieks
Volume of the course: parts and credits points	1 part, 4.5 credits
Language of instruction	LV, EN
Annotation	Digital quantities, number systems, logic functions, Boolean algebra and laws, Karnaugh map, analysis and design of combinational logic circuits, fixed function logic circuits, programmable logic and its description methods.
Goals and objectives of the course in terms of competences and skills	Develop the ability to design control system with help of logic circuits and programmable logic and to debug the developed circuits.
Structure and tasks of independent studies	Description of laboratory work should be prepared before lab. Analysis and evaluation of results should be made after it. Descriptions of all practical exercises and analysis of results should be collected and defended prior session.
Recommended literature	J.Greivulis, I.Raņķis „Iekārtu vadības elektroniskie elementi un mezgli" Rīga:Avots, 1997,288 lpp. J. Priedīte „Ciparu tehnika energoautomātikā" Rīga: RTU, 2003, 312. lpp. I.Rankis, A.Zhiravetska „Electronics" Riga:RTU, 2005,110 p T.L. Floyd „Digital fundamentals" Prentice Hall, 2005, 888 p Holdsworth, B.; Woods, R.C. „Digital Logic Design" Newnes, 2003, 521 p
Course prerequisites	Basic knowledge of analog and digital quantities, number systems and integrated circuits.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Key terms of digital electronics.	2	0	0	0
Number systems and codes.	4	0	0	0
Laws and rules of Boolean algebra and methods of logic expression simplification.	2	0	0	0
Analysis of combinational logic circuits.	2	0	0	0
Design of combinational logic circuits.	2	0	0	0
Flip-Flops.	2	0	0	0
Calculation of timer switching frequency.	1	0	0	0
Analysis and design of synchronous counters.	2	0	0	0
Design of sequential logic.	2	0	0	0
Analysis and design of synchronous decade counter.	2	0	0	0
Design of control system.	7	0	0	0
Digital circuit description language VHDL.	2	0	0	0
Design flow in Quartus environment.	2	0	0	0
1st Lab. Design of combinational logic with VHDL.	2	0	0	0
2nd Lab. Sequential circuit design with VHDL.	2	0	0	0
3rd Lab. Digital circuit description in Quartus environment.	2	0	0	0
4th Lab. Design of combinational logic in Quartus environment.	2	0	0	0
5th Lab. Design of sequential logic in Quartus environment.	2	0	0	0
6th Lab. Control system design with help of Quartus environment and its implementation in programmable logic.	6	0	0	0
Total:	48	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Ability to apply arithmetic operations to binary number system.	Executed and defended home task.
Ability to describe functions of logic gates, to recognize the symbols of logic gates and to evaluate parameters of integrated circuits.	Exam on relevant subjects covered in lectures.

Ability to develop the truth table, to design the combinational and sequential logic circuits and control system.	Laboratory works on control system design should be executed and defended.
Ability to design the digital circuits in Quartus environment by different methods.	Laboratory works on digital circuit design by circuit editor and VHDL language should be executed and defended.
Ability to use programmable logic devices for digital electronics applications.	Laboratory works on programmable logic circuit usage and debugging should be executed and defended. Exam on relevant subjects covered in lectures.

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	4.5	2.0	0.0	1.0		*	