# RTU Course "Digital Devices of Telecommunications Systems"

**13104 null**

*General data*

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| Code | RAE701 |
| Course title | Digital Devices of Telecommunications Systems |
| Course status in the programme | Compulsory/Courses of Limited Choice |
| Responsible instructor | Andis Supe |
| Academic staff | Toms Salgals |
| Volume of the course: parts and credits points | 1 part, 4.0 Credit Points, 6.0 ECTS credits |
| Language of instruction | LV, EN |
| Annotation | This course is intended for the study of the basic knowledge (key terms, operating principles, typical applications), related to computer general architecture, the operating principles of computer`s main components, the sequence of instruction execution, and the basic programming skills in assembler language. The main topics of the course: types of addresses in processor systems, single-byte microprocessor instruction set and its programming basics, floating-point number formats and associated co-processor, computer memory, memory addressing systems and data protection, command and data pipelining, design features of signal processors and applications. |
| Goals and objectives of the course in terms of competences and skills | The aim of the study course is to learn basic knowledge related to the overall architecture of computers, a central processor structure, memory devices, instruction execution sequence, and the principles of programming in assembler language.<br><br>The tasks of the study course:<br>*To introduce the terminology related to the course;<br>*To learn to recognize the main components of a computer and its basic construction principles;<br>*To provide knowledge about the overall computers` structure and different architectures;<br>*To explain the principles of memory addresses;<br>*To provide knowledge about software algorithms;<br>*To promote understanding of microprocessor programming in Intel IA8 and Microchip assembler languages;<br>*To explain microprocessors and their selection criteria; |
| Structure and tasks of independent studies | Independent work is organized in the form of individual study of lecture materials, solving the tasks set by the lecturer, and preparing laboratory work reports. |
| Recommended literature | Obligātā literatūra / Obligatory literature:<br>1. Lekciju materiāli ORTUS sistēmā<br>2. Andrew S. Tanenbaum and Herbert Bos "Modern Operating Systems (4th Edition)", Pearson, 2015, 1101 p.<br>3. Andrew S. Tanenbaum and Todd Austin "Structured Computer Organization, 6th ed.", Pearson, 2012, 769 p.<br>4. Ata Elahi "Computer Systems: Digital Design, Fundamentals of Computer Architecture and Assembly ", Springer, 2018, 261 p.<br>5. Linda Null, Julia Lobur: “The Essentials of Computer Organization And Architecture”, (2nd Edition), Jones & Bartlett Pub, (February 2006), ISBN-10: 0763737690<br>6. Paul Horowitz, Winfield Hill ’’The Art of Electronics 3rd edition’’ Cambridge University Press, 2015, 1192 p.<br>7. Paul A. Carter ‘’PC Assembly Language’’<br>8. Descriptions of laboratory works. Microprocessor PCM 80Y/01 - applications and programming.<br>9. Aldis Baums. Datoru arhitektūra un organizācija. 2010, Rīga. 236 lpp<br><br>Papildliteratūra / Additional literature:<br>1. Mano Kime ’’Logic and Computer Design Fundamentals 4th edition’’<br>2. M. Rafiquzzaman ‘’Fundamentals of Digital Logic’’ (2005)<br>3. R. P. Jain. McGraw-Hill “Modern Digital Electronics,” 2008., 636 p.<br>4. M. Predko. Digital Elektronics Guidebook. New-York: Mc Graw - Hill, 2002. 530 lpp.<br>5. B. Holdsworth, C. Woods “Digital Logic Design, 4th edition,” Newnes, 2002., 519 p.<br>6. A. Saha and N. Manna ‘’Digital principles and logic design’’, INFINITY SCIENCE PRESS LLC. 2007, ISBN 978-1-934015- 03-2.<br>7. A. Silberschatz, Peter B. Galvin, Greg Gagne ‘’Operating System Concepts’’<br>8. К.Хамахер, З. Вранешич, С. Заки. Организация ЭВМ, 5-е изд., «Питер», 2003, Москва, Ст-Петербург<br><br>Kursa apguvē var izmantot arī interneta resursus / Internet resources can also be used to acquire the course::<br>Digital Electronics Tutorial: http://www.asic-world.com/digital/tutorial.html |
| Course prerequisites | Digital electronics and computer architecture, Digital devices and systems |

*Course contents*

| Content | Full- and part-time intramural studies | Part time extramural studies |
|---|---|---|

| | Contact Hours | Indep. work | Contact Hours | Indep. work |
|---|---|---|---|---|
| A computer overall structure and different architectures | 8 | 8 | 0 | 0 |
| Single-byte CISC microprocessors | 6 | 6 | 0 | 0 |
| CISC and RISC architecture | 4 | 4 | 0 | 0 |
| Multi-byte microprocessors. Intel, AMD, Microchip PIC and other types | 4 | 4 | 0 | 0 |
| Multi-core processors | 4 | 4 | 0 | 0 |
| Instruction execution process and pipelining | 4 | 4 | 0 | 0 |
| Computer memory devices and memory addressing organization | 8 | 8 | 0 | 0 |
| Types of assember languages | 8 | 8 | 0 | 0 |
| Programming in assembler language | 12 | 12 | 0 | 0 |
| Operating systems | 8 | 8 | 0 | 0 |
| DSP microprocessors and microcontrollers. Texas Instruments and others | 8 | 8 | 0 | 0 |
| Field-programmable gate array (FPGA) | 6 | 6 | 0 | 0 |
| Total: | 80 | 80 | 0 | 0 |

*Learning outcomes and assessment*

| Learning outcomes | Assessment methods |
|---|---|
| The student knows the terminology associated with the course topics. | Test, exam |
| The student understands the functionality of the main units of computers and the general principles of their construction. | Test, exam |
| The student understands the differences between CISC and RISC architectures regarding the instruction execution process. | Test, exam |
| The student is familiar with the operating principles of single-core and multi-core processors. | Test, exam |
| The student is able to work with memory addressing systems. | Test, exam |
| The student understands the principles of how to create software algorithms. | Laboratory works, test, exam |
| The student is capable of programming in Intel IA8 in the assembler language. | Laboratory works, test, exam |
| The student is familiar with the main characteristics of micro-controllers and their selection criteria, depending on the application. | Test, exam |

*Evaluation criteria of study results*

| Criterion | % |
|---|---|
| Tests | 30 |
| Laboratory works | 20 |
| Exam | 50 |
| Total: | 100 |

*Study subject structure*

| Part | CP | Hours per Week | | | Tests | | |
|---|---|---|---|---|---|---|---|
| | | Lectures | Practical | Lab. | Test | Exam | Work |
| 1. | 4.0 | 2.0 | 0.0 | 2.0 | | * | |