

SYLLABUS¹

1. Information about the Program

1.1 Higher education institution	Politehnica University of Timișoara
1.2 Faculty ² / Department ³	Automation and Computers/ Computers
1.3 Chair	-
1.4 Domain of study	Computers and Information Technology
1.5 Study level	Bachelor
1.6 Study programme / Qualification	Computers / Engineer

2. Information about the Course

2.1 Course	Computer Architecture						
2.2 Lecturer	Asist. dr. ing. Flavius Oprețoiu						
2.3 Academic staff for seminars/labs	Drd. ing. Andreea Bozesan						
2.4 Study year	2	2.5 Semester	3	2.6 Assessment type	E	2.7 Course type	Mandatory

3. Total time estimated (hours/ semester of didactical activities)

3.1 Hours / week	4	of which:	3.2 lecture hours	2	3.3 seminar/lab hours	2
3.4 Total curriculum hours	59	of which:	3.5 lecture hours	28	3.6 seminar/lab hours	28
Time distribution						hours
Study using manuals, support materials, bibliography and notes						28
Supplementary documentation in library, speciality electronic platforms and on site						9
Supplementary preparation for seminars/labs, homeworks, reviews, portofolios and essays						25
Tutoring activities						3
Exams						3
Other						
3.7 Total - hours of individual study						65
3.8 Total - hours per semester						124
a. Credits						5

4. Prerequisites (if appropriate)

4.1 curriculum	<ul style="list-style-type: none"> Electrical Engineering Fundamentals; Digital Logic
4.2 competencies	<ul style="list-style-type: none"> Elementary knowledge of Physics and Mathematics

5. Conditions (if appropriate)

5.1 for lectures	<ul style="list-style-type: none"> Spacious classroom, Support materials: laptop, projector, blackboard.
5.2 for seminars/labs	<ul style="list-style-type: none"> Laboratory with at least 15-20 computers – Hardware design and simulation environments, reconfigurable platforms, course specific test equipment, blackboard

¹ Formularul corespunde Fișei Disciplinei promovată prin OMECTS 5703/18.12.2011 (Anexa3);
² Se înscrie numele facultății care gestionează programul de studiu căruia îi aparține disciplina;
³ Se înscrie numele departamentului căruia i-a fost încredințată susținerea disciplinei și de care aparține titularul cursului;

6. Specific competencies acquired

Professional competencies ⁴	<ul style="list-style-type: none"> • Operating with fundamentals of sciences, engineering, and computer science • Designing hardware, software and communication components • Problem solving using the instruments of computer science and engineering • Improving the performance of hardware, software and communication systems • Designing, managing the lifecycle, integration and integrity of hardware, software and communication systems
Transversal competencies	<ul style="list-style-type: none"> •

7. Objectives of the course (issued from the list of the competencies acquired)

7.1 Aim	<ul style="list-style-type: none"> • Introduce the specific notions and terminology pertaining to the structure of a computer system and its components
7.2 Specific objectives	<ul style="list-style-type: none"> • Offering an overview over the structure of a computing system • Presenting the general notions of arithmetic in computer systems • Design and implementation of arithmetic and logic units • Acquire control unit design and debug skills

8. Content

8.1 Lecture	Hours	Instruction methods
1. REPRESENTATION OF NUMBERS IN COMPUTING SYSTEMS 1.1. Information classification 1.2. Representation of fixed point numbers 1.3. Representation of floating point numbers	9	Lectures are held in a classical manner enhanced by sufficient examples. The interrogative teaching approach is supported by ample discussions of the important aspects.
2. FUNCTIONAL ANALYSIS AND SYNTHESIS OF BINARY AND DECIMAL ADDING AND SUBTRACTING DEVICES 2.1. Serial adders 2.2. Parallel adders 2.3. Parallel subtractors	10	
3. FUNCTIONAL ANALYSIS AND SYNTHESIS OF BINARY MULTIPLICATION DEVICES 3.1. Binary multiplication methods 3.2. Synthesis of sequential binary multiplier 3.3. Binary multiplication speedup	9	
References		
<ol style="list-style-type: none"> 1. J. L. Hennessy, D. A. Patterson: "Computer Architecture: A Quantitative Approach", Morgan Kaufman, editia a IV-a, 2006, ISBN: 0123704901 2. M. Vladutiu: "Computer Arithmetic: Algorithms and Hardware Implementations", Springer, ISBN: 364218314X 3. D. A. Patterson, J. L. Hennessy: "Computer Organization and Design: the hardware/software interface", Morgan Kaufman, editia a IV-a, 2012, ISBN: 0123747503 4. R. E. Bryant, D. R. O'Hallaron: "Computer Systems: A Programmer's Perspective", Addison Wesley, editia a II-a, 2010, ISBN: 0136108040 		
8.2 Seminar/lab	Hours	Instruction methods
1. Introduction to Hardware Description Languages	2	Introduction to the assignment, discussion, questions, computer simulation, synthesis using the FPGA platform
2. Presenting Verilog language	3	
3. Verilog components	2	
4. Case study: Binary adder-subtractor	4	
5. Component instantiation	3	
6. Testbench modules	4	
7. Case study: Carry Lookahead Adder	3	
8. Modelsim environment	2	
9. Verilog components simulation	3	
10. Application: Robertson multiplier	2	
References		
<ol style="list-style-type: none"> 1. Jean-Pierre Deschamps, Gery J.A. Bioul, Gustavo D. Sutter: "Synthesis of Arithmetic Circuits: FPGA, ASIC and Embedded Systems" Wiley-Interscience, 2006, ISBN: 0471687839 2. Mi Lu: "Arithmetic and Logic in Computer Systems" Wiley-Interscience, 2004, ISBN: 0471469459 3. John F. Wakerly: "Digital Design: Principles and Practices", Prentice Hall, editia a IV-a, 2005, ISBN: 0131733494 		

⁴ Aspectul competențelor profesionale va fi tratat cf. Metodologiei OMECTS 5703/18.12.2011. Se vor prelua competențele care sunt precizate în Registrul Național al Calificărilor din Învățământul Superior RNCIS (http://www.rncis.ro/portal/page?_pageid=117,70218&_dad=portal&_schema=PORTAL) pentru domeniul de studiu de la pct. 1.4 și programul de studii de la pct. 1.6 din această fișă.

9. Correlation between the course content and the requirements of the specialists in the field and the expectations of the main employers

- Knowledge of the structural components of a computer is essential in designing a digital system and, at the same time, ensures an elementary level of competence in evaluation and maintenance of a hardware-software system.
- The vast majority of the representative employers in the field require knowledge of the computer systems structure, in general, and, in particular, abilities to optimize an application for a particular hardware implementation platform.

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in final mark
10.4 Lecture	Synthetic presentation of a concept introduced in the course	Written examination	25%
	Make use of the acquired design abilities in solving a problem similar to the examples presented in the course	Written examination	30%
10.5 Seminar /labs	Completing the laboratory assignments	Presenting the simulation and synthesis results and defending the proposed solution	25%
	Homework	Presenting the solution and defending the proposed approach	15%
	Classroom presence	Mark the student presence	5%
10.6 Minimal performance standards (minimal specific knowledge required for passing the exam, the means to assess mastering the specific knowledge)			
<ul style="list-style-type: none"> • Understanding data representation modes in computers: sign-magnitude, C1, C2 codes and the IEEE 754 standard • Knowledge of the fundamental solutions for binary addition: design of Ripple Carry, Carry Lookahead adders as well as binary subtractors • Comprehension of binary multiplication methods: design of sequential and combinational structures for multiplication including Robertson's and Booth's methods • Digital design skills: constructing a control unit by using the One Hot method 			

11. International compatibility

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| 1 | Carnegie Mellon University http://www.ece.cmu.edu/~ece740/f13/doku.php |
| 2 | Berkeley University http://inst.eecs.berkeley.edu/~cs152/sp13 |
| 3 | Stanford University http://class2go.stanford.edu/EE282/Spring2013 |

Date
Signature of the course instructor
Asist. Flavius Oprețoiu

Signatures of the academic staff for seminars/labs
Drd. Andreea Bozeșan

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Date of approval in the Department

Signature of the Department Director
Prof. Vladimir Crețu

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