SYLLABUS[1]

1. **Information about the Program**

1.1 Higher education institution	Politehnica University of Timişoara
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			Digital Microsystems Design				
2.2 Lecturer			Assoc. Prof. Marius Marcu				
2.3 Academic staff for seminars/labs			Oana Amaricai-Boncalo				
2.4 Study year	III	2.5 Semester	5	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	108	of which:	3.5 lecture hours	28	3.6 seminar/lab hours	28
Time distribution						hours
Study using manuals, support materials, bibliography and notes						10
Supplementary documentation in library, speciality electronic platforms and on site						9
Supplementary preparation for seminars/labs, homeworks, reviews, portofolios and essays						28
Tutoring activities						2
Exams						3
Other						0

3.7 Total - hours of individual study	47
3.8 Total - hours per semester	108
a. **Credits**	4

4. Prerequisites (if appropriate)

4.1 curriculum	• Programming Techniques • Computer architecture
4.2 competencies	• Operarea cu fundamente științifice, inginerești și ale informaticii • Proiectarea componentelor hardware, software și de comunicații

5. Conditions (if appropriate)

5.1 for lectures	• Large class room • Video-projector, notebook, blackboard
5.2 for seminars/labs	• Large laboratory room • 10 desktop computers

1 Formularul corespunde Fişei Disciplinei promovată prin OMECTS 5703/18.12.2011 (Anexa3);

2 Se înscrie numele facultăţii care gestionează programul de studiu căruia îi aparţine disciplina;

3 Se înscrie numele departamentului căruia i-a fost încredinţată susţinerea disciplinei şi de care aparţine titularul cursului;

6. Specific competencies acquired

Professional competencies[4]	• Operarea cu fundamente științifice, inginerești și ale informaticii • Proiectarea componentelor hardware, software şi de comunicaţii • Soluţionarea problemelor folosind instrumentele ştiinţei şi ingineriei calculatoarelor • Îmbunătățirea performanțelor sistemelor hardware, software și de comunicații • Proiectarea, gestionarea ciclului de viață, integrarea şi integritatea sistemelor hardware, software şi de comunicaţii
Transversal competencies	• Comportarea onorabilă, responsabilă, etică, în spiritul legii pentru a asigura reputaţia profesiei • Demonstrarea spiritului de iniţiativă şi acţiune pentru actualizarea cunoştinţelor profesionale, economice şi de cultură organizaţională

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

7.1 Aim	• This course covers the hardware design of a microprocessor-based system
7.2 Specific objectives	• Acquiring the overview over the microprocessor components and their behavior and their external interfaces to the system • Acquiring the capacity to analyze and design microprocessor based systems • Acquiring the ability to implement and test low level application for x86 processors

8. Content

8.1 Lecture	Hours	Instruction methods
1. Introduction 1.1 Computer history and evolution 1.2 Grand challenge computational problems 1.3 Computer systems taxonomy 1.4 Overall architecture of a microprocessor 1.5 Overall architecture of a digital microsystem 1.6 Challenges and trends	2	PowerPoint presentations, discussions, examples
2. Central processing unit 2.1 Intel x86 based family processors 2.2 8086 microprocessor 2.3 80386 microprocessor 2.4 Microprocessor external bus 2.5 x86 Instruction set architecture 2.6 x86 execution modes 2.7 CPU cycles	6	
3. Memory 3.1 Memory technologies: ROM, SRAM, DRAM		

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

3.2 Memory decoder design 3.3 Memory bus 3.4 Memory cycles 3.5 Connecting memories to CPU 3.6 Memory controller	4	
4. Input/output 4.1 I/O ports 4.2 I/O decoder design 4.3 I/O bus 4.4 Connecting I/O ports to CPU 4.5 Applications	4	
5. Specialized I/O 5.1 Parallel interface 5.2 Serial interface 5.3 Timers 5.4 I/O chipset 5.5 Applications	4	
6. Direct memory access 6.1 DMA controller 6.2 System DMA 6.3 Bus master DMA	2	
7. Interrupts 7.1 Software and hardware interrupts 7.2 Interrupt vector table 7.3 Interrupt service routines 7.4 Interrupt controller	2	
8. Applications 8.1 Keyboard 8.2 Digital display elements 8.3 Communications	4	

References

1. Jean-Loup Baer, Microprocessor Architecture: From Simple Pipelines to Chip Multiprocessors, Cambridge University Press, 2010
2. M. Popa, Proiectarea microsistemelor digitale, Editura Orizonturi Universitare, Timişoara, 2003
3. M. Popa, Sisteme cu microprocesoare, Editura Orizonturi Universitare, Timişoara, 2003

8.2 Seminar/lab	Hours	Instruction methods
1. Development board Z3/EV and extension modules E16/EV, F11/EV, F12/EV	2	Laboratory topic presentation and discussion, laboratory requirements implementation, Laboratory results presentation and questions
2. Programming x86 processors in assembly language	2	
3. x86 processor cycles visualization	2	
4. Memory decoder design	2	
5. I/O decoder design	2	
6. Target system requirements analysis and specification	2	
7. Microprocessor system design specification	2	
8. Connecting LED-s to CPU	2	
9. Connecting mini-keyboard to CPU	2	
10. Connecting LCD to CPU	2	
11. Serial communication	2	
12. Parallel communication	2	
13. Interrupt service routines	2	
14. Final project presentations	2	

References

1. http://software.intel.com/
2. M. Popa, Proiectarea microsistemelor digitale, Editura Orizonturi Universitare, Timişoara, 2003

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

- Continental Automotive
- Alcatel-Lucent
- Hella

10. Assessment

Activity type	10.1 Assessment criteria	10.2 Assessment methods	10.3 Weight in final mark
10.4 Lecture	Digital microsystem design fundaments	Written exam	25%
	Digital microsystem design applications	Written exam	25%
10.5 Seminar /labs	Solving the topics proposed during the laboratory	Laboratory deliverables presentation and questions	25%
	Semester project development and presentation	Project deliverables presentation and questions	25%
10.6 Minimal performance standards (minimal specific knowledge required for passing the exam, the means to assess mastering the specific knowledge)			
• Overall microprocessor architecture and behavior; overall microprocessor system architecture and behavior • Memory decoding, I/O decoding • Connecting memory to CPU • Connecting I/O to CPU			

11. **International compatibility**

- Virginia Tech University, Microprocessor System Design
  http://www.ccm.ece.vt.edu/twiki/pub/Main/LectureNotes/01-Introduction.pdf
- San José State University, Microprocessor-Based System Design
  http://www.engr.sjsu.edu/tle/120syl.pdf
- University of Michigan, Design of Microprocessor-Based Systems
  http://web.eecs.umich.edu/~prabal/teaching/eecs373-f11/

Date	Signature of the course instructor	Signatures of the academic staff for seminars/labs
	Conf. dr. ing. Marius MARCU	Sl. dr. ing. Oana Amaricai-Boncalo
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Date of approval in the Department

Signature of the Department Director

Prof. dr. ing. Vladimir CREȚU

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