**Approved by: Head of Department**

**PhD. Eljona Proko**

**COURSE PROGRAM**

**CS 348 Computer Architecture**

**Lecturer:** Fjoralba Janku, Lecturer, Master of Science.

**Hours:** 8 credits, 3 lec / 2 sem

**Typology:** Specific Subject

**Academic year / semester:** 2019/ Spring

**Type of course:** Mandatory

**Study program:** Bachelor in Informatics, Computer Science, Information Technology

**Course code:** CS 348

**The electronic address of the lecturer:** [fjoralba.sota@gmail.com](mailto:fjoralba.sota@gmail.com)

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**SUMMARY AND LEARNING RESULTS:** Computer architecture is the science and art of designing, selecting, and interconnecting hardware components and co- designing the hardware/software interface to create a computer that meets functional, performance, energy consumption, cost, and other specific goals.

Computer architecture focuses on the structure and behavior of functional modules of a computer system and how they interact to provide the processing user needs .The course material is divided into 8 chapters. The first chapter deals with the main elements of computer hardware. The second chapter deals with all types of instructions and modes of addressing. The third chapter deals with assembler language and examples, written in assembler language and communication between the memory and cache. The fourth chapter analyzes the elements of CPU processing unit, where a special place is occupied by organization of micro programmed and hardwired control. The fifth chapter deals with the types of memory, its hierarchy, and cache miss and hit cases, virtual and ROM memories. Chapter six addresses all modes of communication between the hardware I / O. Interrupts and equipment identifications occupy an important place in this chapter. Also, the types of buses, and serial and parallel interfaces take an important place. Chapter seven makes a comprehensive presentation of the pipeline processor. Chapter eight deals with CISC and RISC technologies and makes a comparison between them. Also we mention multiprocessor systems.

At the completion of this course, students will be able to satisfy the following:

* Define computer architecture,
* Explain the instruction set architecture and its importance in the design of computer systems;
* Explain the design of the arithmetic logic unit (ALU) and the processor, data path and control;
* Design combinational and sequential digital logic circuits;
* Provide the values of control lines to implement instructions;
* Describe the organization of the central processing unit (CPU) and memory hierarchy;
* Demonstrate how memory caches and virtual memory work;
* Evaluate the performance of a pipeline;
* Measure, evaluate, summarize, & report the performance of a computer system

**Basic Concepts:**

1. Computer Architecture
2. Instruction Set Architecture .
3. Addressing Modes
4. Central Processing Unit CPU
5. Memory Hierarchy
6. Input/Output design
7. Pipeline

**Lectures Topics:**

**Theme I:** The following topics will be addressed in lectures:

1. Introduction to Computer Architecture, History, Technology,
2. Performance of computer system
3. Construction and architecture sets of instructions. Addressing Modes
4. Types of instruction. programming examples
5. Assembler language, syntax, and command directives.
6. Examples of the Assembler programming in a simple machine.
7. Construction of CPU's. Data path.
8. Register set. CPU Instruction Cycle.
9. Construction and operation of the Control Unit.
10. Micro programmed Control Unit.
11. Hardwired Control Unit.
12. Construction of Memories. Its hierarchy. What is CACHE Memory
13. Mapping techniques cache - main memory.
14. Examples of mapping techniques.
15. Some techniques for CASHE optimization.
16. Main memory, Construction. Read and Write operations.
17. Virtual Memory. Mapping techniques virtual - main memory.
18. Replacing Algorithms.
19. Read Only Memory ROM.
20. The basic concepts of I / O organization.
21. Programmed I/O.
22. Interrupt – driven I/O.
23. Direct Memory Access, DMA.
24. Communication Busses, bus arbitration.

**Seminars Topics:**

1. Knowledge consolidation in Computer Architecture, History, Technology, Performance
2. Programming examples
3. Exercises on Assembler language, syntax, and command directives.
4. Examples in Assembler programming in a simple machine.
5. Knowledge consolidation in CPU organization.
6. Knowledge consolidation in Micro programmed Control Unit. Exercises.
7. Knowledge consolidation in Hardwired Control Unit Control. Exercises.
8. Knowledge consolidation and exercises in cache mapping.
9. Knowledge consolidation in virtual memory.
10. Exercises with virtual memory. Replacing Algorithms.
11. Knowledge consolidation in I / O organization.
12. Knowledge consolidation in I / O organization. Interrupt – driven I/O. Direct Memory Access, DMA.
13. Knowledge consolidation in Bus Organization.
14. Knowledge consolidation in Pipelining techniques organization, its construction scheme.
15. Pipeline performance Exercises.
16. Pipeline performance Exercises.
17. Knowledge consolidation in Organization of CISK and RISK processors. The differences between them.
18. Knowledge consolidation in multiprocessor systems.

**Theme III:** Topics that will be addressed in, laboratory work, assignments etc:

1 Course Project: Students have to work independently; treat different aspects of the functional modules of a computer, the trend in advances for increasing the performance of a computer.

**STUDENT EVALUATION FORMS**

|  |  |
| --- | --- |
| Control | Percentage evaluation |
| Control I | 25% |
| Annual evaluation | 15% |
| Final control | 60% |

Evaluation of students is done based on Percentage evaluation conversion; grade 5-10 progressively 41- 100% Student, resulting in less than 75% attendance for the period that belongs to the partial exam, period in which will be tested, will not be introduced in the respective exam, will be evaluated with M. If a student has attended the course, but is not present in the exam will be estimated NP (Not Present).

**Course format:**

The course will be evaluated on the basis of a partial exam, assignments and final exam. Points received will be cumulative. Exams will not be repeated, for any reason. If you will miss an exam without a major reason, then you will lose points for that examination in which you did not attend.

**TEXT BOOK**

* “Fundamentals of Computer Organization and Architecture”, M.Abd-El-Barr, 2005, ISBN 0-471-46740-5
* “Computer Architecture”, Peterson and Henessy, ISBN 13: 978-0-12-370490-0
* “Computer Organization and Architecture”, William Stallings, ISBN-13:978-0-13-607373-4
* “Computer Architecture”, Betim Cico, 2007

**CONCLUDING REMARKS FROM LECTURER**

If you have any problem or question, please send e-mail with the subject "CS 348". E-mail may take a few days to respond. Enter the subject "Urgent CS 348" if your problem is urgent and cannot wait. Students are invited to not send e-mail relating to the course without the subject: CS 348. Before the students make a question, make sure that this information was not found in the official website of UV. Students are not invited to make questions through e-mail about course content because is better to answer them in the auditor, in the presence of other students. Before students ask a question, make sure this information is not found on the course website: https://sites.google.com/site/fjoralbasota .

**Email**: Every student is obliged to regularly check e-mail. Different tasks and notifications will be made only by e-mail.

**Code of honesty**: Not permitted to work in groups for homework, as they are individual. Also not allowed to copy in.