Computer architecture

Instructions for attending courses and taking exams

Organization of lectures and practical classes

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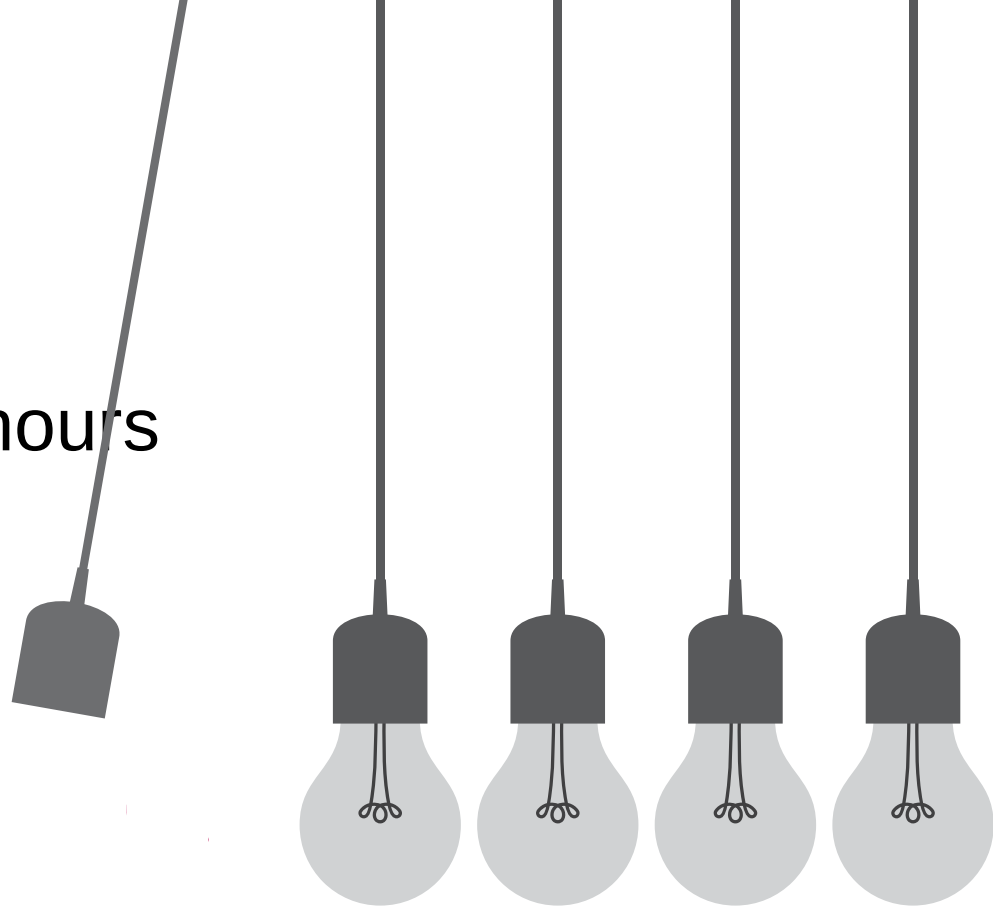
Conducting classes:	Lectures	2 hours per week: - Every week - 30 hours total
	Practical classes	2 hours per week - By groups according to the schedule - 30 hours total

Course information

- 5 ECTS credits = 150 student working hours
  - 30 hours of lectures
  - 30 hours of practical classes
  - 60 hours of working from home
- Obligatory course



Course objective

The objective of this module is to enable students to lean:

- the concepts of computer architecture
- the low-level building blocks of any computer system
- how CPU, memory, and other subsystems interact on a lower level
- multi-core and parallel processing in modern-day computer architectures Students learn the theoretical background of different computer architectures, and how they relate to the most common computer architectures that we currently use. Aims of this module are for students to learn the low level aspect of looking at a computer system, without any higher-level approach - in programming terms, this module only uses low-level, assembly-approaches. This module is important for students as it will enable them to learn different and current operating systems (system engineering) and applications (programming). They will also learn low-level approaches to design computer hardware and how to make correct decisions when creating environments for employees or clients (system engineering), or when creating applications (programming).

Learning outcome sets

Label of a learning outcome set	Name of a learning outcome set	ECTS credits
S1	Computer architecture	1
S2	Processor architecture	2
S3	Exceptions at the hardware level	1
S4	Muticore processors	1

Learning outcomes

Set	Outcome	MINIMUM LEARNING OUTCOMES (upon succesful completion of the course, students will be able to)	DESIRED LEARNING OUTCOMES (succesful students should be able to)
S1	I1	Differentiate between the structure and the elements of a motherboard in a personal computer and sketch the architecture, modules and circuits of a processor.	Create a simple ALU using circuit simulator.
S2	I2	Analyse the phases of performing instructions and the state of the bus, and combine basic, branching and looping instructions in assembler assignments.	Evaluate the performance of instructions and bus states in the given assignment and write assembler code using an assigned instruction set.
	I3	Sketch and analyse the structure and the basic elements of the ALU and the control unit.	Write complex assembler code with the usage of ALU instructions.
S3	I4	Analyse the concept and organisation of the interrupt system and methods of data transfer.	Evaluate the concept and organisation of the interrupt system and methods of processing exceptions.
S4	I5	Analyse the parallelism on a processor, multicore processors and systems with multiple processors.	Evaluate the issues about parallelism on a processor, multicore processors and systems with multiple processors.
	I6	Compare SMP and NUMA memory models on systems with multiple processors.	Recommend the best possible design of computer system for specific use case based on SMP and NUMA memory models.

Thematic units of the course

Course week	Unit	Course week	Unit
Week 1	**Intro lecture and basic terms**	Week 9	**Exceptions**
Week 2	**Circuits, logic, busses, branching, looping**	Week 10	**Exception handling**
Week 3	**Flynn's classification, von Neumann model, Turing machine, RISC, CISC**	Week 11	**Paralelism 1**
Week 4	**Basic computer parts**	Week 12	**Paralelism 2**
Week 5	**Elements of an ALU**	Week 13	**Memory systems**
Week 6	**Elements of an control unit**	Week 14	**In memory/close to memory systems, emerging technologies**
Week 7	**Hardware security 1**	Week 15	**SMP and NUMA principles**
Week 8	**Hardware security 2, recap**		

Literature

Official literature

- Ledin, J. (2020) Modern Computer Architecture and Organization, Livery Place, 35 Livery Street, Birmingtham B3 2PB, Packt Publishing.

Recommended literature

- Meyers, M. (2019) CompTIA A+ Certification All-in-One Exam Guide, Tenth Edition, 1325 Avenue of the Americas, New York, NY 10019, McGraw Hill Education.
- Heath, S. (1995) Multiprocessor Architectures: RISC, CISC and DSP 2nd Edition, Linacre House Jordan Hill, Oxford OX2 8DP, Elsevier

- + anything published on InfoEduca system

What is necessary to get a signature?

In order to obtain the right to a signature, it is necessary to participate in class at the percentage rate prescribed by the Book of Regulations on studies and studying.

Lectures and practical classes participation	
At least 50 % of physical presence in lectures	At least 60 % of physical presence in practical classes

Whoever fails to obtain a signature will have to enroll in the same course the following year, to pay the enrollment and does not have the right to take the exam.

In addition to the attendance, there's another condition for getting the digital signature:

- passing of two examinations related to LO3 and LO6. These need during the scheduled lab assignment for LO3 and LO6. If a student misses that deadline, examinations need to be turned in in writing, a week after that **at latest**. Failing to do so == no digital signature.

Passing courses

- A course has 6 defined learning outcomes divided into 4 learning outcome sets.
- **In order for students to pass a course, they need to achieve at least 50% of credits of the total credit amount within each of the learning outcome**.
- **If students fail to achieve at least 50 % of credits of a learning outcome, they are required to take the learning outcome during the next exam period.**
- **Students need to pass an examination related to two schoolwork assignments (related to LO3 and LO6) to get the digital signature.**
- **Students need to deliver all the remaining labwork to TA on time (one week after the lab assignment at latest).**
- The learning outcome sets evaluation methods:
  - Midterm exams
  - Schoolwork preparation and examination

LO3 and LO6 examination

- It will be conducted as a part of lab assignment
- Students will be required to read through and learn the content of a couple of published scientific papers related to certain topics
- LO3 examination will be about hardware security and side-chain attacks on computer hardware
- LO6 examination will be about SMP and NUMA principles
- The digital signature will be approved only after the work has been corrected (provided that the minimum attendance at classes is achieved at the same time).

How does this relate to learning outcomes

Set	Outcome	M1	M2	Schoolwork	MAX
S1	**I1**	14		2	16
S2	**I2**	15		2	17
	I3	15		2	17
S3	**I4**		15	2	17
S4	**I5**		15	2	17
	I6		14	2	16
	Outside of the outcome				0
	Total	**44**	**44**	**12**	**100**

Grading

Number of points achieved	Grade
0,00 – 50,00	1 (insufficient)
50,01 – 58,00	2 (sufficient)
58,01 – 75,00	3 (good)
75,01 – 92,00	4 (very good)
92,01 – 100,00	5 (excellent)

Exams

- Each course complies with the **3 + 1 rule**.
  - This means that a student can take an exam a maximum of 4 times.
    - 3 regular exams – included in the tuition fee
    - 1 extraordinary exam – 700 HRK for 4th registration of exam pursuant to the Decision on Reimbursement of Expenses
  - The deadline for passing an exam is **12 months** from the day of enrolment in the course.
  - If a student fails to pass a course within 12 months, **he/she must re-enrol in the course and re-take all learning outcomes defined in the course**.
- **Keep track of deadlines for registering and cancelling exams on IE.**
  - If you failed to register an exam on time, you cannot take neither the written nor the oral exam.
  - If a student registers for multiple examination periods of the same course, after obtaining a satisfying grade, he/she must cancel his/her registration for all subsequent examination periods of that course. Otherwise, an insufficient (1) will be recorded in Infoeduka for that student.

In addition to the exams

- **The written examination for LO3 needs to be completed by the end of week 8 of this semester.**
- **The written examination for LO6 needs to be completed by the end of week 15 of this semester.**
- **Papers will be available on InfoEduca next week, so you will have plenty of time to prepare.**
- **If you miss this deadline, you'll get an extra week to do the examination in a form of a summary of the allocated scientific papers as will be explained by the TA.**
- Take into account the deadlines for registration and deregistration of the exam at IE.

Academic standard of conduct

- In written and oral communication it is necessary to follow the rules of business communication appropriate for the academic level.
- It is necessary to abide by the strictly defined deadlines for task submissions (homework, seminar papers, projects, etc…).
  - Every task, homework, project etc…, submitted after the defined deadline will not be evaluated nor graded.
- Only those students who can confirm their attendance, will be considered as present.
  - Signing other students, or registering their card is not allowed and may be subject to disciplinary action. The teacher will delete the student's attendance if he / she determines that the student is registered and is not present at the class.

Rules of conduct during classes

- One has to come to class on time.
- Each student should disinfect their hands before accessing the workplace.
- Upon entering the classroom, student registers for classes with a card and then sits in an accessible place for work.
- Compliance with epidemiological measures is mandatory: currently this means wearing a mask in a way that it covers mouth and nose all the time. A student who violates that will be removed from class and reported to the Disciplinary Board.
  - If and when epidemiological measures change, we will adjust the rules.
- Disruption of class and inactive class participation is not allowed.
  - Continuous breaking of this rule is sanctioned by reporting students to the Disciplinary Board.

Thank you for your attention!