English version at the end of this document

Ano Letivo	2020-21
Unidade Curricular	ARQUITETURA DE COMPUTADORES
Cursos	ENGENHARIA INFORMÁTICA (1.º ciclo)
Unidade Orgânica	Faculdade de Ciências e Tecnologia
Código da Unidade Curricular	14781042
Área Científica	CIÊNCIA DE COMPUTADORES
Sigla	
Línguas de Aprendizagem	Português
Modalidade de ensino	Presencial
Docente Responsável	Peter Stallinga

DOCENTE	TIPO DE AULA	TURMAS	TOTAL HORAS DE CONTACTO (*)
Peter Stallinga	T; TP	T1; TP1; TP2	28T; 56TP
João Miguel Gago Pontes de Brito Lima	TP	TP3	28TP

* Para turmas lecionadas conjuntamente, apenas é contabilizada a carga horária de uma delas.

ANO	PERÍODO DE FUNCIONAMENTO*	HORAS DE CONTACTO	HORAS TOTAIS DE TRABALHO	ECTS
1º	S2	28T; 28TP	156	6

* A-Anual;S-Semestral;Q-Quadrimestral;T-Trimestral

Precedências

Sem precedências

Conhecimentos Prévios recomendados

Sistemas Digitais

Objetivos de aprendizagem (conhecimentos, aptidões e competências)

Após a conclusão da disciplina, os alunos deverão compreender os princípios básicos da arquitetura, dos sistemas mais simples até os sistemas mais avançados, para além do comportamento e desempenho desses sistemas em relação ao software e aplicações reais (incluindo alguns aspectos da otimização de código e do desenvolvimento de código em assembly e C).

Conteúdos programáticos

Chapter 0: Revision of Digital Systems

Chapter 1: Integration
- Arithmetic Logic Unit (ALU)
- 1 bit ALU ¿ n-bit ALU
- micro assembler
- Data path
- Central-processing unit (CPU)
- macro assembler

Chapter 2: Memory
- Information theory
- static memory/dynamic memory
- cache
- Harvard Architecture
- Von Neumann Architecture
- Little Endian/Big Endian
- Heap/Stack
- Garbage collection
- Virtual memory
- Addressing methods
- Overlay

Chapter 3: Hardware/Software
- BIOS/bootstrapping
- Interrupts
- Bus
- Northbridge / Southbridge
- External communications
- Error detection and correction, redundancy

Chapter 4: Assembly
- Machine Language
- Operands, operators, operations
- jumps
- conditional jumps
- memory access
- arithmetic and shift
- I/O
- registers
- arrays and structures
- functions
- floating point

Chapter 5: Numbers and arithmetic
- positive and negative integers
- multiplication and division
- floating point (IEEE 754)

Chapter 6: Examples of architectures
- Difference Engine
- Intel 4004
- MOS 6502
- x86
- AVR Atmel

Metodologias de ensino (avaliação incluída)

As aulas são baseadas na sebenta que está baseada no livro "Computer Architecture" do Peter Stallinga. Não é necessário rigorosemente nada além deste material pedagógico.

A parte prática consiste em programar em MIPS assembly. É usado um emulador em Java que corre em qualquer computador que tem Java.

Exame sem consulta, a parte T (70%) sendo obrigatória. Avaliação contínua da parte TP (30%) com trabalhos TPC. Aprovação do aluno:
- nota TP igual ou superior a 9,0
- nota exame T igual ou superior a 9,0
- nota ponderada (30/70) igual ou superior a 9,5

Bibliografia principal

Sebenta Stallinga

Livro "Computer Architecture" do Stallinga

extra:

Structured Computer Organization - Tannebaum

MIPS - Britton

Academic Year	2020-21
Course unit	COMPUTER ARCHITECTURE
Courses	INFORMATICS (COMPUTER SCIENCE) (1st Cycle)
Faculty / School	FACULTY OF SCIENCES AND TECHNOLOGY
Main Scientific Area	
Acronym	
Language of instruction	Portuguese
Teaching/Learning modality	Face to face learning
Coordinating teacher	Peter Stallinga

Teaching staff	Type	Classes	Hours (*)
Peter Stallinga	T; TP	T1; TP1; TP2	28T; 56TP
João Miguel Gago Pontes de Brito Lima	TP	TP3	28TP

* For classes taught jointly, it is only accounted the workload of one.

Contact hours

T	TP	PL	TC	S	E	OT	O	Total
28	28	0	0	0	0	0	0	156

T - Theoretical; TP - Theoretical and practical ; PL - Practical and laboratorial; TC - Field Work; S - Seminar; E - Training; OT - Tutorial; O - Other

Pre-requisites

no pre-requisites

Prior knowledge and skills

Digital Systems

The students intended learning outcomes (knowledge, skills and competences)

After finishing this subject, students must understand the basic principles of architecture, from the simplest systems to the more advanced, the behavior and performance of these in relation to software and real applications. From gates to higher-programming lenaguages such as C, and everything in-between.

Syllabus

Chapter 0: Revision of Digital Systems

Chapter 1: Integration
- Arithmetic Logic Unit (ALU)
- 1 bit ALU ¿ n-bit ALU
- micro assembler
- Data path
- Central-processing unit (CPU)
- macro assembler

Chapter 2: Memory
- Information theory
- static memory/dynamic memory
- cache
- Harvard Architecture
- Von Neumann Architecture
- Little Endian/Big Endian
- Heap/Stack
- Garbage collection
- Virtual memory
- Addressing methods
- Overlay

Chapter 3: Hardware/Software
- BIOS/bootstrapping
- Interrupts
- Bus
- Northbridge / Southbridge
- External communications
- Error detection and correction, redundancy

Chapter 4: Assembly
- Machine Language
- Operands, operators, operations
- jumps
- conditional jumps
- memory access
- arithmetic and shift
- I/O
- registers
- arrays and structures
- functions
- floating point

Chapter 5: Numbers and arithmetic
- positive and negative integers
- multiplication and division
- floating point (IEEE 754)

Chapter 6: Examples of architectures
- Difference Engine
- Intel 4004
- MOS 6502
- x86
- AVR Atmel

Teaching methodologies (including evaluation)

lectures are based on the lecture notes that is in turn based on the book "Computer Architecture" of Peter Stallinga. No other sources are needed for the lectrures.

The practival part cosnsists of programming in MIPS assembly. An emulator is used that is written in Java and thus runs in any environemnet that has Java

Closed book exam, Theoretical part T (70%) is obligatory. The conitnuous evaluation consists fo homework assignments in MIPS TP (30%).
A student passes if:
- TP at least 9.0
- T at least 9.0
- Average mark (30/70) at least 9.5

Main Bibliography

Lecture notes of Stallinga

Book "Computer Architecture" of Stallinga

extra:

Structured Computer Organization - Tannebaum

MIPS - Britton