Hes·so VALAIS WALLIS
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Conception numérique (DiD)

Introduction

IND

Filière Systèmes industriels
Filière Energie et techniques environmentales
Filière Informatique et systèmes de communications

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ISC Modules 1ère année

https://www.hevs.ch/media/document/20/plan-etude-isc-v1-02.pdf

	Cours	*Heures*	*Crédits*
1ère année	**Semestre 1**	**32**	**28**
	Algèbre linéaire 1	4	4
	Analyse 1	6	5
	Communication 1	2	2
	Ethique et aspects juridiques	2	2
	Langues 1	4	3
	Programmation impérative	8	7
	Systèmes numériques	*6*	*5*
	Semestre 2	**36**	**32**
	Algèbre linéaire 2	4	4
	Analyse 2	6	5
	Architecture des ordinateurs	*4*	*3*
	Communication 2	2	2
	Intro. à la sécurité	4	3
	Langues 2	4	3
	Programmation objet	8	6
	Réseaux	4	6
	Projet 1	Summer school	3

But du cours

Savoir interpréter le cahier des charges fonctionnel d'un système simple (C) et le représenter sous forme numérique (A)

Appliquer les principes de base de la conception numérique selon les méthodologies proposées (A)

Réaliser la fonction logique qui en découle (A)

Valider la conception numérique réalisée selon les méthodologiques de simulation et de test (J)

Contenu du cours

Cahier des charges

MSb **NUM** LSb

11110101

Binary dig**IT**

a	b	y
0	0	0
0	1	1
1	0	1
1	1	0

Table de vérité

KAR

Table de Karnaugh

COM **MUX**

Eléments de logique combinatoire

Circuit numérique combinatoire

LST

Compteur

CNT

$$y = a(b + c) = ab + ac$$

Equation polynomiale

$$Q_0^+ = \overline{Q_0}$$
$$Q_1^+ = Q_0 \oplus Q_1$$

Q_A	Q_B	Q_A^+	Q_B^+
0	0	1	0
0	1	0	0
1	0	1	1
1	1	0	1

Table d'état

FPGA

MET

LAT

Eléments de logique séquentielles

FSM

Machine d'état

Blague

There are 10 types of people in this world. Those who understand binary and those who don’t.

Il y a 10 types de personnes dans ce monde. Ceux qui comprennent le binaire et ceux qui ne le comprennent pas.

Map of Computer Science

THEORETICAL COMPUTER SCIENCE

COMPUTATIONAL COMPLEXITY
DOES P≠NP?
NXN CHESS PSPACE NXNGO
NP COMPLETE: TRAVELLING SALESMAN, MAP COLOURING
NP: GRAPH ISOMORPHISM
BQP: DISCRETE LOGARITHM, FACTORING
P: TESTING IF PRIME, GRAPH CONNECTIVITY
EFFICIENT FOR A QUANTUM COMPUTER
EFFICIENT FOR A COMPUTER

INFORMATION THEORY
0100110100011001
COMPRESSION
ENTROPY
ERROR CORRECTION
0 0 1 0
1 0 1 1
1 1 0 1
1 0 1 1
CODING THEORY
PARITY CHECKING

CRYPTOGRAPHY
PUBLIC KEY
ALL THE SECRETS
7bh;"
~Gmp
$Avr
PRIVATE KEY

COMPUTABILITY THEORY
ALAN TURING
INFINITELY LONG TAPE
HEAD
LAMBDA CALCULUS

TURING MACHINE
STATE REGISTER
1: MOVE LEFT
2: MOVE RIGHT
3: FLIP DIGIT
123: STOP

AND MORE
PARALLEL PROGRAMMING
MAIN JOB
JOB 1
JOB 2
JOB 3
JOB 4
SMALLER JOBS

ALGORITHMS
BUBBLESORT(A)
1: GO FROM LEFT TO RIGHT.
2: COMPARE EACH PAIR.
3: IF LEFT ONE HIGHER, SWITCH.
4: DO UNTIL NO MORE SWITCHES.
BUBBLE SORT $O(n^2)$
1 2 3 4 5 6 7 8
MERGE SORT $O(n \log n)$
1 2 3 4 5 6 7 8
ANALYSIS OF ALGORITHMS
ALGORITHMIC COMPLEXITY

LOGIC
ZERO ONE NOT OR AND XOR NAND

GRAPH THEORY

COMPUTATIONAL GEOMETRY

AUTOMATA THEORY

QUANTUM COMPUTATION
$|0\rangle$ $|1\rangle$ $\frac{|0\rangle+|1\rangle}{\sqrt{2}}$

COMPUTER ENGINEERING

HARDWARE
MONITOR
SOUND
SSD
CPU
RAM
INPUT
POWER
CPU
MOTHERBOARD

DATA STRUCTURES
LINKED LIST
LIST
TREE
GRAPH
STACK
HASHING

FORMAL METHODS
START
POSSIBLE STATES
ALERT

SCHEDULING
PROCESSES
SCHEDULER
CPU 1 CPU 2 CPU 3 CPU 4
MULTIPROCESSING

COMPUTER ARCHITECTURE
CPU
CENTRAL PROCESSING UNIT
CONTROL UNIT
ARITHMETIC/LOGIC UNIT
MEMORY UNIT
INPUT
OUTPUT
GPU
MULTIPROCESSORS
FPGA
LOGIC BLOCK
INTERCONNECTION
INPUT/OUTPUT
SWITCH BOX
CONNECT BLOCK

SOFTWARE AND PROGRAMMING LANGUAGES
PYTHON
JAVASCRIPT
PERL
PHP
SWIFT
SQL
JAVA
C#
C++
C
ASSEMBLY
WEB APPS
BROWSER
APPLICATIONS
OPERATING SYSTEM
BIOS
SILICON
MACHINE CODE
JAVASCRIPT
COMPILER
C++
COMPILER
C
COMPILER
ASSEMBLY
COMPILER

COMPILERS

DATA MANAGEMENT
DATABASES
SQL
DATACENTRES

NETWORKING
CONCURRENT/DISTRIBUTED/PARALLEL/SYSTEMS

OPERATING SYSTEMS
iOS
macOS

SOFTWARE ENGINEERING
FORMAL METHODS
UNIT TESTING
VERSION CONTROL
OBJECT ORIENTED DESIGN

PERFORMANCE
COMPUTER ANALYSIS
BENCHMARKING

APPLICATIONS

MACHINE LEARNING
SUPERVISED
UNSUPERVISED
NEURAL NETWORK
CAT
REINFORCEMENT

OPTIMISATION
FINANCE
LEAGUE OF LEGENDS
AMAZON WAREHOUSE

BOOLEAN SATISFIABILITY
x_1 OR x_2 OR $\bar{x}_3$ (SAT)
$\bar{x}_1$ OR $\bar{x}_2$ OR x_3
$\bar{x}_1$ OR $\bar{x}_2$ OR $\bar{x}_3$
$\bar{x}_1$ OR x_2 OR x_3

SUPER COMPUTING

COMPUTER GRAPHICS

COMPUTATIONAL SCIENCE
COMPUTATIONAL PHYSICS
NUMERICAL ANALYSIS
BIOINFORMATICS
COMPUTATIONAL CHEMISTRY

HACKING

ARTIFICIAL INTELLIGENCE
A.I.

ROBOTICS

COMPUTER VISION
FIND THE HUMANS

IMAGE PROCESSING

NATURAL LANGUAGE PROCESSING
CHATBOTS
-HEY
HELLO THERE-
-ARE U A ROBOT?
YES-
WAIT, I MEAN NO-
-PROVE IT!
CALCULATING...-
I MADE YOU CAKE-

KNOWLEDGE REPRESENTATION
SCONES
TEA
FLOUR
BUTTER
BIRTHDAY
CAKE
FOOD
BACON
CELEBRATION
PANCAKE
BREAKFAST

TELEPRESCENCE

AUGMENTED REALITY
YOUTUBE
DOMAIN OF SCIENCE
MAP OF COMPUTER SCIENCE

VIRTUAL REALITY

SIMULATION

HUMAN COMPUTER INTERACTION

INTERNET OF THINGS

BIG DATA

BY DOMINIC WALLIMAN ©2017

Electronique numérique

Domaines d'application

Electronique numérique

Exemple de voiture

Electronique numérique

Ariane 5

https://youtu.be/PK_yguLapgA

Electronique numérique

Futurama Bender

https://youtu.be/_4TPlwwHM8Q

Electronique numérique

Moore's Law

Number of transistors double every two years
- Gordon Moore -

Data source: Wikipedia (wikipedia.org/wiki/Transistor_count)
OurWorldinData.org – Research and data to make progress against the world's largest problems.

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ISC Organisation

- Cours ($2^{Heures}/_{Semaine}$)
- Labore ($4\,^{Heures}/_{Semaine}$)
- Projet (Display $\approx 3 - 5\ Semaine$)
- Examen
  - Semaine 47 (17.11.2025 – 21.11.2025)

	Semestre automne (DiD)			*Semester printemps (CAr)*		
Evaluation	Exa 1	Project	Exa Sem	Labo	Project	Exa Sem
Exam Coefficient	0.5	0.5	1	0.5	0.5	1
Semester Coefficient	1		1	1		1
Module Coefficient	5/9			4/9		

Bien réussir dans ce cours

- **Présence obligatoire**
  - La présence à tous les cours est obligatoire. Seuls les professeurs peuvent accorder une **dispense**.
- **Prise de notes**
  - Il est **indispensable de prendre des notes**, en particulier lors des **exemples et exercices** faits en classe.
  - Les **solutions élaborées ensemble au tableau** peuvent être recopiées.
- **Travail personnel**
  - Des **exercices complémentaires** sont à réaliser à la maison.
  - Un **travail personnel régulier** est **indispensable** pour assimiler la matière.
- **Aide et accompagnement**
  - Le **cours de complément** ainsi que le **canal MS Teams** sont à votre disposition pour **poser des questions** sur la **théorie** et les **exercices**.
- **Correction d'exercices**
  - Les **exercices** peuvent être **remis à un professeur** pour **correction**.

Projet de semestre

Informatique et systèmes de communication

Display

Organisation

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Serveurs et fichiers

Informatique et systèmes de communication

- **Moodle ISC Learn**
  - 102.1 – Digital design
  - Password: *welcome*

INFORMATIONS DU MODULE - MODULINFORMATIONEN

MODULE DID - KURS DID

Le module "102 Architecture materielle" est composé des deux cours suivants: 102.1 Systèmes numériques et 102.2 Architecture des ordinateurs.

Vous trouverez tous les documents de cours sur le repo Git.

Das Modul "102 Materielle Architektur" besteht aus den beiden folgenden Kursen: 102.1 Digitale Systeme und 102.2 Computerarchitektur

Alle Kurs
Repositor

- **Microsoft Teams**
  - 25_ISC_Car
  - Access Code: **ia5sw6e**

QUESTIONS

CAN BE ASKED BY ANYONE ANYTIME

WHY ARE THERE MIRRORS ABOVE BEDS
WHY DO I SAY UH
WHY IS SEA SALT BETTER
WHY ARE THERE TREES IN THE MIDDLE OF FIELDS
WHY IS THERE NOT A POKEMON MMO
WHY IS THERE LAUGHING IN TV SHOWS
WHY ARE THERE DOORS ON THE FREEWAY
WHY ARE THERE SO MANY SVCHOST·EXE RUNNING
WHY AREN'T ANY COUNTRIES IN ANTARCTICA
WHY ARE THERE SCARY SOUNDS IN MINECRAFT
WHY IS THERE KICKING IN MY STOMACH
WHY ARE THERE TWO SLASHES AFTER HTTP
WHY ARE THERE CELEBRITIES
WHY DO SNAKES EXIST
WHY DO OYSTERS HAVE PEARLS
WHY ARE DUCKS CALLED DUCKS
WHY DO THEY CALL IT THE CLAP
WHY ARE KYLE AND CARTMAN FRIENDS
WHY IS THERE AN ARROW ON AANG'S HEAD
WHY ARE TEXT MESSAGES BLUE
WHY ARE THERE MUSTACHES ON CLOTHES
WHY WUBA LUBBA DUB DUB MEANING
WHY IS THERE A WHALE AND A POT FALLING
WHY ARE THERE SO MANY BIRDS IN SWISS
WHY IS THERE SO LITTLE RAIN IN WALLIS
WHY IS WALLIS WEATHER FORECAST ALWAYS WRONG
WHY ARE THERE MALE AND FEMALE BIKES
WHY ARE THERE BRIDESMAIDS
WHY DO DYING PEOPLE REACH UP
HOW FAST IS LIGHTSPEED
WHY ARE OLD KLINGONS DIFFERENT

WHY AREN'T THERE DINOSAUR GHOSTS

WHY ARE THERE SQUIRRELS

WHY IS THERE HELL IF GO

WHY HAVE DINOSAURS NO FUR
WHY DO IGUANAS DIE
WHY ARE SWISS AFRAID OF DRAGONS
WHY IS THERE A LINE THROUGH HTTPS
WHY IS THERE A RED LINE THROUGH HTTPS ON TWITTER
WHY IS HTTPS IMPORTANT
WHY IS YKK ON ALL ZIPPERS

WHY AREN'T MY ARMS GROWING

WHY ARE THERE WEEKS
WHY DO I FEEL DIZZY
WHY AREN'T ECONOMISTS RICH
WHY DO AMERICANS CALL IT SOCCER
WHY ARE MY EARS RINGING
WHY IS 42 THE ANSWER TO EVERYTHING
WHY CAN'T NOBODY ELSE LIFT THORS HAMMER
WHY IS MARVIN ALWAYS SO SAD
WHY IS THERE LAVA
WHY IS THERE A SWARM OF ANTS
WHY IS THERE PILEGRIM
WHY ARE THERE SO MANY CROWS IN ROCHESTER
WHY IS TO BE OR NOT TO BE FUNNY
WHY DO CHILDREN GET CANCER
WHY IS POSEIDON ANGRY WITH ODYSSEUS
WHY IS THERE ICE IN SPACE
WHY ARE THERE ANTS IN MY LAPTOP
WHY ARE DOGS AFRAID OF FIRE
WHY IS THERE NO KING IN EN
WHY IS EARTH TILTED
WHY IS SPACE BLACK
WHY IS OUTER SPACE SO COLD
WHY ARE THERE PYRAMIDS ON THE MOON
WHY IS NASA SHUTTING DOWN
WHY ARE THERE FEMALE

WHY ARE THERE GHOSTS

WHY IS THERE AN OWL IN MY BACKYARD
WHY IS THERE AN OWL OUTSIDE MY WINDOW
WHY IS THERE AN OWL ON THE DOLLAR BILL
WHY DO OWLS ATTACK PEOPLE
WHY ARE FPGA's EVERYWHERE
WHY ARE THERE HELICOPTERS CIRCLING MY HOUSE
WHY ARE THERE GODS
WHY ARE THERE TWO SPOCKS
WHY ARE MY BOOBS ITCHY
WHY ARE CIGARETTES LEGAL
WHY ARE THERE DUCKS IN MY POOL
WHY IS JESUS WHITE
WHY IS THERE LIQUID IN MY EAR
WHY DO Q TIPS FEEL GOOD
WHY DO PEOPLE DIE
WHY IS LIFE SO
WHAT IS https://xkcd.com/1256/
WHY DO THEY SAY T-MINUS
WHY ARE THERE OBELISKS
WHY ARE WRESTLERS ALWAYS WET
WHY ARE OCEANS BECOMMING MORE ACIDIC
WHY ARE THERE TINY SPIDERS IN MY HOUSE
WHY DO SPIDERS COME INSIDE
WHY ARE THERE HUGE SPIDERS IN MY HOUSE
WHY ARE THERE LOTS OF SPIDERS IN MY HOUSE
WHY ARE THERE SPIDERS IN MY ROOM
WHY ARE THERE SO MANY SPIDERS IN MY ROOM
WHY DO SPYDER BITES ITCH
WHY IS DYING SO SCARY
WHY IS THERE NO GPS IN LAPTOPS
WHY DO KNEES CLICK
WHY AREN'T THERE E GRADES
WHY

WHY AREN'T THERE GUNS IN HARRY POTTER

WHY $2*B \mid \overline{2*B}$

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