

Embedded Systems

2022/2023

Overview

Embedded Systems

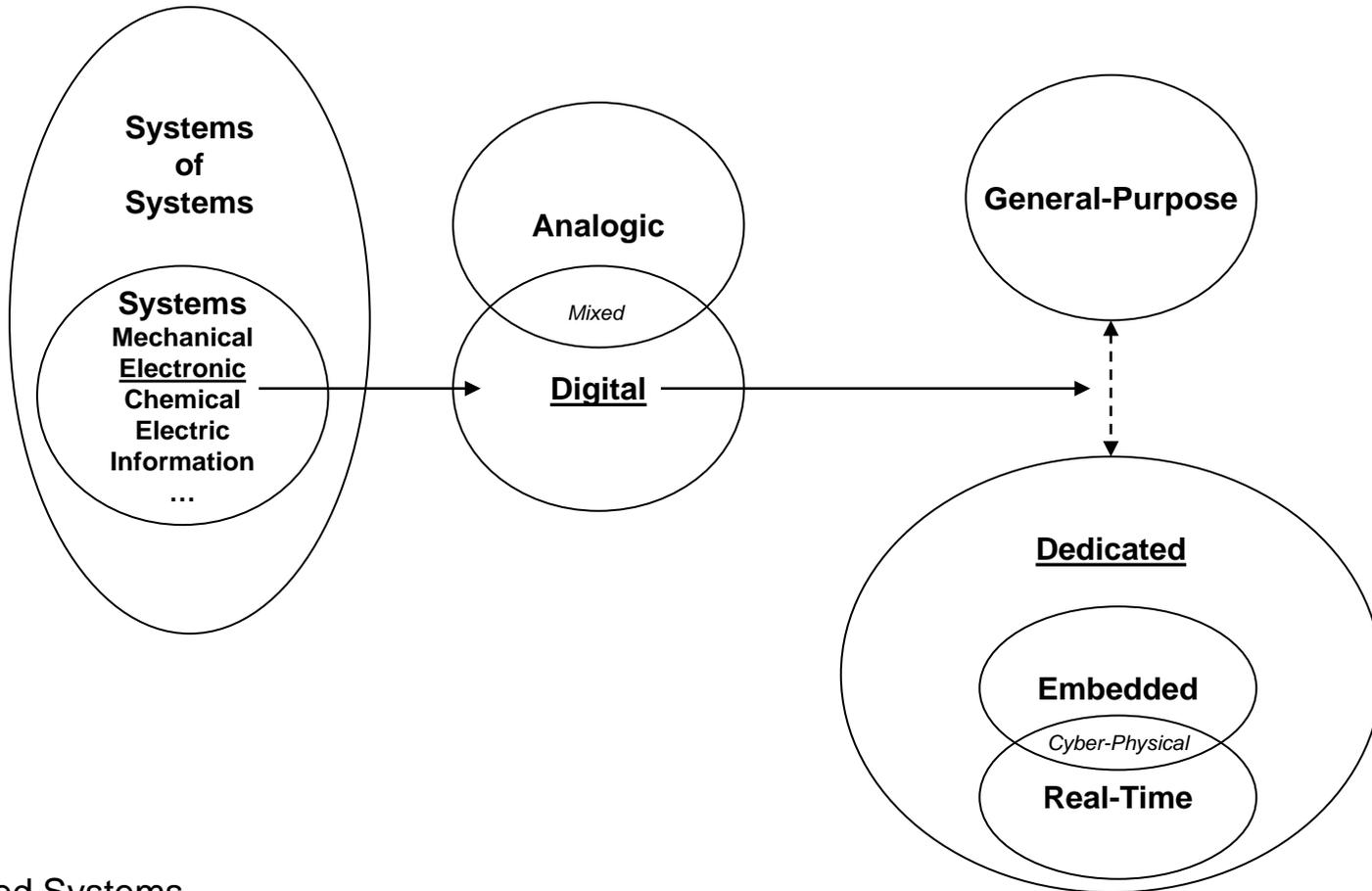
- Excuse me, please. But...

...what is an embedded system?!?!?

From: <http://en.wikipedia.org/>

Embedded Systems

- A wider vision



Embedded Systems

- General structure of the course
 - 9 CFU: I4S (CSE, ISCAES), I4I (IT, E-PiCo), [I4E]
 - Near 90 “hours” of lessons
 - Basic “theoretical” concepts about the development of HW/SW dedicated/embedded systems
 - Technical/practical seminars and case studies
 - 6 CFU: I4S (E-PiCo), I4D/I4T
 - Only a subset of the full program will be requested for examination
 - 6 CFU: [F4I]
 - Only a subset of the full program will be requested for examination

Embedded Systems

- General structure of the course
 - Scheduling
 - Tuesday
 - 11.45-13.15
 - Thursday
 - 09.00-10.15
 - 10.30-11.30
 - Friday
 - 14.30-16.00

Embedded Systems

- Lecturer
 - Dr. Luigi Pomante
 - Assistant Professor (Tenured) – DISIM/DEWS
 - Contacts
 - » email: luigi.pomante@univaq.it
 - » web site : www.pomante.net (**course website**)
 - » **Course mailing list:** [embeddedsystems@univaq2223](mailto:embeddedsystems@univaq.it)
send an e-mail to luigi.pomante@univaq.it to subscribe
 - » Office hours by appointment (e-mail)
 - Main collaborators
 - Assistant Professors: Dr. Giacomo Valente, Dr. Vittoriano Muttillio
 - Post-docs: Dr. Marco Santic

Embedded Systems

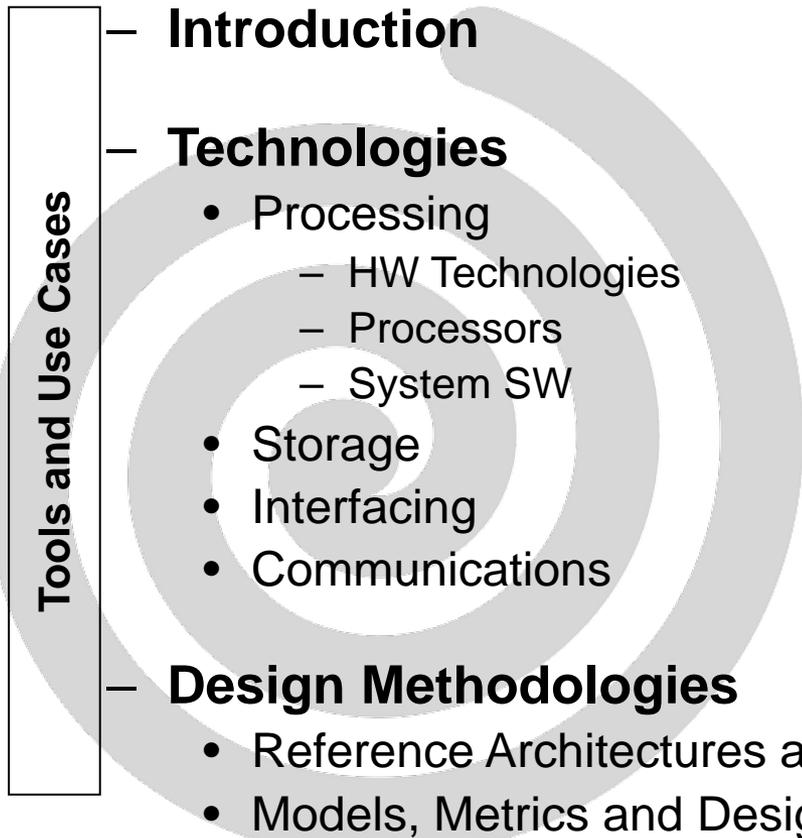
- Goals
 - To provide a structured and homogeneous view about technologies, methodologies and tools for HW/SW developments
 - To provide awareness about implementation issues during the analysis of theoretical concepts that needs a practical follow-up
 - To provide some (practical) knowledge about HW/SW development tools currently used in the academic and industrial worlds
 - Useful backgrounds
 - Computer Science, Digital Electronics
 - Computer Architecture, Operating Systems
 - Electrical/Wireless Communications

Embedded Systems

- Why?
 - It is preparatory for the following ICT professional figures
 - Embedded Systems Designer
 - A figure that **knows, is able to select and use HW/SW technologies** and related development tools
 - Embedded SW Developer
 - A figure that **knows HW/SW technologies, is able to select and use SW technologies** and related development tools
 - EDA (*Electronic Design Automation*) SW Developer
 - A figure that **knows HW/SW technologies** and related development tools, and **is able to develop SW tools useful to support embedded systems designers**
 - Project manager
 - A figure that **knows and is able to select HW/SW technologies** and related development tools in order to manage complex e-ICT projects

Embedded Systems

- Syllabus

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- **Introduction**
 - **Technologies**
 - Processing
 - HW Technologies
 - Processors
 - System SW
 - Storage
 - Interfacing
 - Communications
 - **Design Methodologies**
 - Reference Architectures and Design Issues
 - Models, Metrics and Design Flows

Embedded Systems

- (Official) Educational Material
 - **Main book (English)**
 - Embedded System Design: A Unified HW/SW Introduction (ESD)
 - F. Vahid, T. Givargis - John Wiley & Sons 2001 (<http://esd.cs.ucr.edu/>)
 - How much is it? Low cost versions on...
 - » <http://www.abebooks.com/>
 - » <http://www.abebooks.it/>
 - » <https://www.amazon.it/>
 - » <https://www.amazon.com/>
 - » <http://www.addall.com/>
 - Low-quality pdf
 - » www.pomante.net/Temp/EmbeddedSystemDesign_UnifiedHWSWIntroduction_OK.zip
 - Slides and other documents available on the course website

Embedded Systems

- (Supplementary) Educational Material
 - English books
 - Real-Time Concepts for Embedded Systems
 - Qing Li & Caroline Yao - CMP Books 2003
 - *Introduction to Embedded Systems*
 - *A Cyber-Physical Systems Approach*
 - » E. A. Lee and S. A. Seshia, 2nd edition, 2017
 - » <https://ptolemy.berkeley.edu/books/leeseshia/>
 - *Digital Design and Computer Architecture*
 - Harris&Harris – MK 2012 (MIPS), 2015 (ARM), RISC-V (2021)

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- (Supplementary) Educational Material
 - Italian books
 - Sistemi Embedded: Sviluppo HW e SW per sistemi dedicati
 - W. Fornaciari, C. Brandolese - Pearson – Prentice Hall 2007
 - *Sistemi digitali e architettura dei calcolatori*
 - Harris&Harris – Zanichelli 2016 (ARM)
 - Ask for more, if you like... 😊

Embedded Systems

- **Examination Rules**

- HomeLabs: 0 points (just mandatory)
 - Fixed single/group activities with specific HW/SW development kits
 - » Output: brief report to summarize the work done and the main problems and possible discussion with homelab responsible
- Project: up to 9 points
 - More detailed info in the next lessons
- Theory: up to 12 points
 - A mix of written true/false/open questions and oral discussion related to the (Official) Educational Material and the HomeLabs
 - » The program will be properly reduced for 6 CFU courses
- C4uC: up to 12 points
 - Development (i.e., analysis, design, implementation) of a C program for microcontrollers to solve a given problem

>30 points == 30L

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Any question?