

Embedded Systems

2026/2027

Overview

Embedded Systems

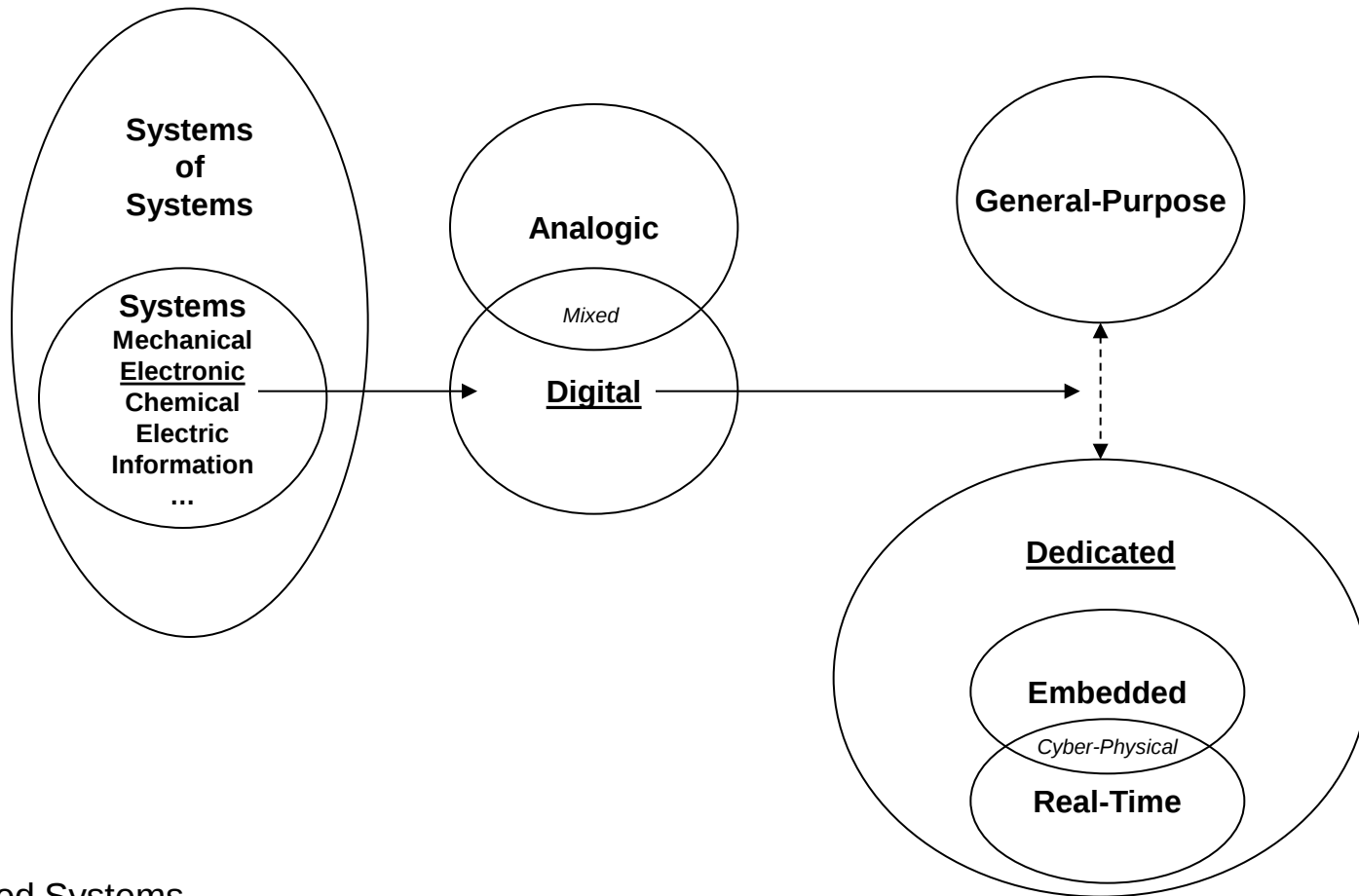
- Excuse me, please. But...

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

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

Embedded Systems

- A wider vision



Embedded Systems

- General structure of the course
 - 6 CFU
 - Near 60 “hours” of lessons
 - Basic “theoretical” concepts about the development of HW/SW dedicated/embedded systems
 - Technical/practical seminars and case studies
 - 9 CFU
 - A project will be defined accordingly for the extra 3 CFU
 - 3 CFU
 - 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
 - Wednesday
 - 14.30-15.45
 - 16.00-17.00

Embedded Systems

- Lecturer
 - Dr. Luigi Pomante
 - Associate Professor – DISIM/DEWS
 - Contacts
 - » email: luigi.pomante@univaq.it
 - » web site: www.pomante.net (**course website**)
 - » **Course mailing list**: embeddedsystemsqa2627
send an e-mail to luigi.pomante@univaq.it to subscribe
 - » Office hours by appointment (e-mail)
 - Main collaborators
 - Assistant Professor: Dr. Giacomo Valente – DISIM (VHDL&FPGA)
 - Post-doc: Dr. Marco Santic – DEWS (C4uC)
 - Assistant Professor: Dr. Giovanni De Gasperis – DISIM (TIVA Lab)

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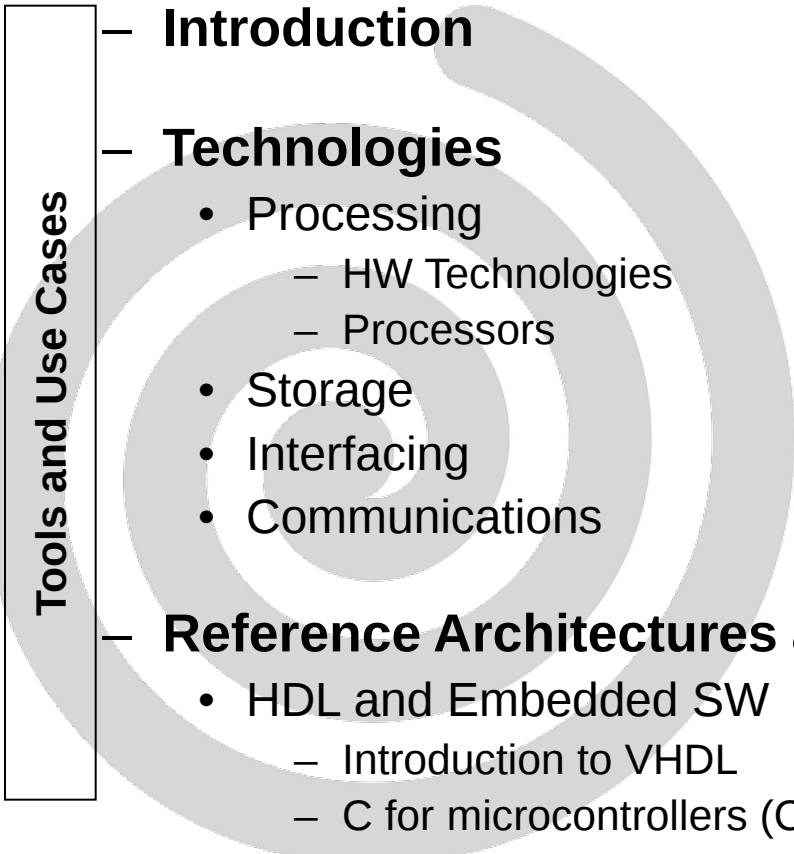
- Goals
 - To provide a structured and homogeneous view about technologies and tools for HW/SW developments
 - To provide awareness about implementation issues during the analysis of theoretical concepts that needs a practical follow-up
 - To provide some (practical) knowledge about HW/SW development 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
 - 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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- Tools and Use Cases**
- **Introduction**
 - **Technologies**
 - Processing
 - HW Technologies
 - Processors
 - Storage
 - Interfacing
 - Communications
 - **Reference Architectures and Design Issues**
 - HDL and Embedded SW
 - Introduction to VHDL
 - C for microcontrollers (C4uC)

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/>)
 - Low-quality pdf
 - » www.pomante.net/Temp/EmbeddedSystemDesign_UnifiedHWSWIntroduction_OK.zip
 - Low cost versions **could be** available on...
 - » <http://www.abebbooks.com/>
 - » <http://www.abebbooks.it/>
 - » <http://www.addall.com/>
 - Slides and other documents available on the course website

Embedded Systems

- (Supplementary) Educational Material
 - English books
 - 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/>
 - Real-Time Concepts for Embedded Systems
 - Qing Li & Caroline Yao - CMP Books 2003
 - *Ask if you want more...*

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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

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- **Examination Rules**

- **HomeLabs:** up to 9 points
 - 3 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
- **Theory:** up to 12 points
 - A mix of written true/false/open questions and a possible oral discussion related only to the (Official) Educational Material
 - » 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 a microcontroller to solve a given problem

>30 points == 30L

The different parts can be done independently over time

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Any question?