Real Time Systems
-- 5 & 10 credits

- Lecturers
  - Pontus Ekberg: 1237, email: pontus.ekberg@it.uu.se
  - Wang Yi, office: 1235, email: yi@it.uu.se

- Assistants
  - Jakaria Abdullah, office: 1236, jakaria.abdullah@it.uu.se
  - Gaoyang Dai, office: 1218, gaoyang.dai@it.uu.se
Wiki's definition

Real time systems will guarantee to give a result within a specified time --- Wiki

“Many” Real-Time Systems also known as “Embedded Systems”
A Real-Time System

65-70 ECU’s/micro-processors in some model of S80
Real-Time/Embedded Systems = Computer Systems hidden in technical products

- Medical devices
- Automotive/Volvo
- Robotics/ABB
- Trains/Bombardier
- Flight control/SAAB
- Plant control/ABB
- Telecomm/Ericsson
- Consumer electronics/Electrolux

Over 99% of all computers produced in the world are embedded systems
Main Goal of this course:

Study Techniques for constructing Real-Time Systems to make sure:

- no bug
- no stop
- no waste (of resources)
Main Topics
(blue=5hp, + red=10hp)

- Real-Time Operating Systems
  - What are the differences with General purpose OS?
- Real Time Programming (Languages)
  - What are the differences with general computing?
- Real-Time Scheduling and Analysis
  - What is the execution time/response time of a program?
- Distributed Systems and Real-Time Communication
  - What is the transmission delay of a message?
- Workload Models (advanced topic)
  - Graph-based task models
- Multiprocessor real-time systems (advanced topic)
  - Multicore processors
- Design and Validation (advanced topic)
  - Modeling and verification
Lab assignments & Software
(blue=5hp, +red=10hp)

- Real Time Programming I (Ada)
- Response Time Analysis (FpsCal)
- Real-Time Programming II (Ada/OS Kernel, Lego)
- Modeling and Analysis (UPPAAL)
Course Form

- Lectures
- Lab assignments
- Playing with Legos! (the 2nd assignment)

- Examination
  - assignments and
  - final written exam (a subset of problems for 5-credits)
Literature

- On-line materials (slides for lectures)

Further readings:
Prerequisites

- Basic understanding of Programming Languages e.g. C
- Basic understanding of Computer Architecture.
- Basic understanding of Operating Systems
M.Sc Program in Embedded System: Overview

- Embedded Computer Systems
- Wireless Communication & Networked Embedded Systems
- Advanced Computer Architectures
- Model-Based Design of Embedded Systems
- Embedded Systems Software
- Hardware and Software Co-Design
- Digital Design Techniques
- Applied Mathematics
- Real Time Systems
- Signal Processing & Automatic Control
- M.Sc. Thesis Work