

# Embedded Processor (System) Design

**Course Description:** This course studies fundamentals of designing embedded systems. The following topics will be covered in the course:

- Review of combinational and sequential logics
- Datapath components such as adders, shifters, counters, etc
- Introduction to VHDL
- Custom single-purpose processor design
- General-purpose processor design
- Application-specific processor design
- Commercial processors – ARM processor, Intel 8051 microcontroller, DSP processor
- Peripherals
- Memory
- Interfacing
- Example – digital camera
- Concurrent process models
- Design technology
- Power/Reliability issues
- Reconfigurable architectures

Throughout the course, students will be asked to apply their understanding of the above topics on homework assignments and tests. We will use VHDL to implement simple single-purpose and general-purpose processors. Simulators such as SimpleScalar and XTREME will be used to study and evaluate embedded systems.

**Prerequisites:** Digital Logic Design (mandatory), Computer architecture (strongly recommended)

**Textbook:** Embedded system Design a unified hardware/software introduction, by Frank Vahid and Tony Givargis, John Wiley & Sons, Inc (available on Amazon.com, recommended to buy)

**References:** Computer Organization and Design The Hardware/Software Interface, third edition, by David A. Patterson and John L. Hennessy, Morgan Kaufmann Publisher  
Logic and Computer Design Fundamentals by M. Moris Mano and Charles R. Kime, third edition, Pearson Prentice Hall Publisher  
On-line VHDL resources and research papers

**Class Hours and Classroom:** T/R 1:00 ~ 2:30 PM, L503

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Office Hours: before and after classes, knock on my office door for short questions, or via appointment for a long discussion

**Grading Policy:** Your final grade will consist of the followings: Homework details will be announced later.  
**45%** Seven Homework Assignments **45%** Two Exams **10%** Attendance