ECE 332 – Embedded Systems Lab

Lab 0: Familiarization with Equipment and Software
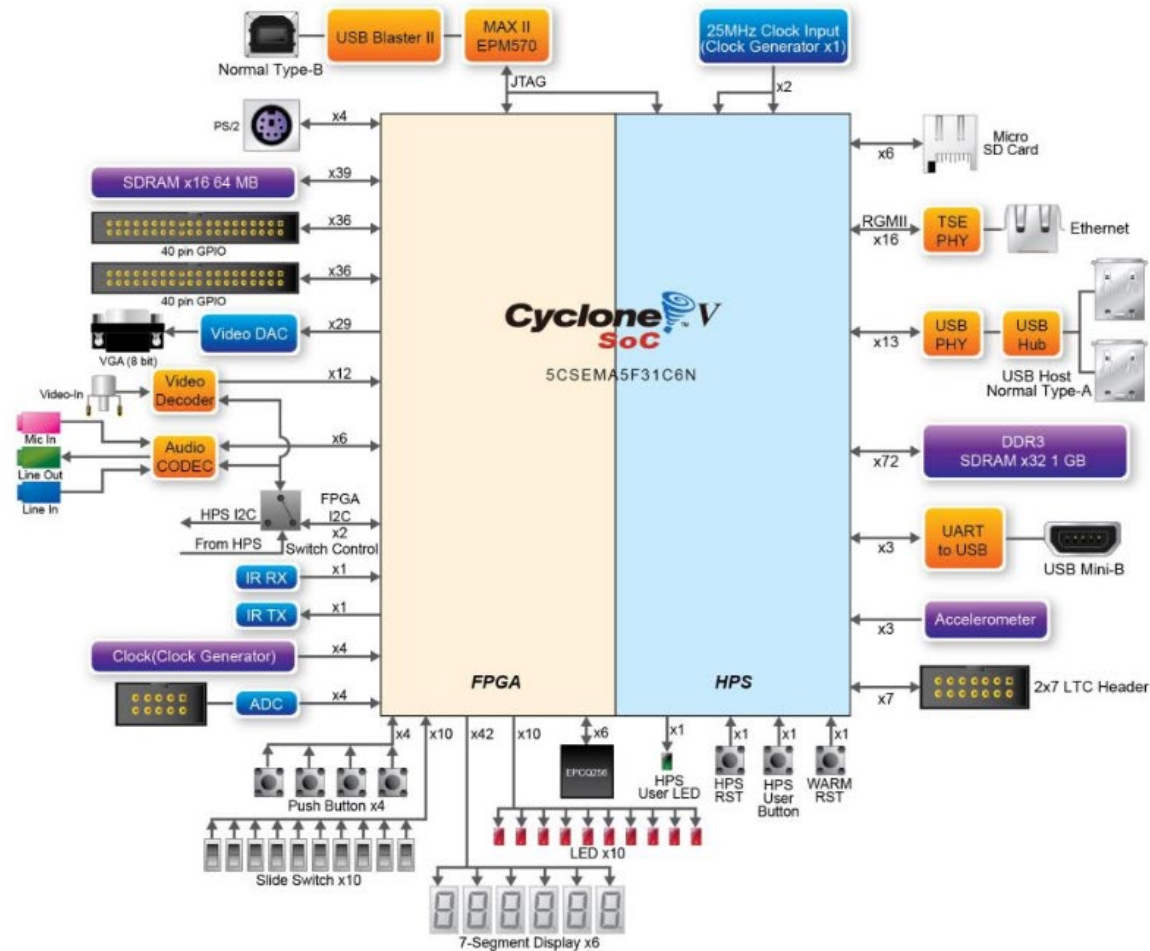
Objectives

- Familiarization with:
  - DE1-SoC board
  - CAD Tools and Development Software

- Software installation

DE1-SoC board

- State of the art System-on-Chip (SoC) FPGA development platform by Altera

- Combines Cyclone V FPGA with latest dual core ARM Cortex A9 Hard Processor System (HPS)

- Provides Reconfigurability paired with high performance

- Features multitude of connectivity options for diverse applications

DE1-SoC board Block Diagram

DE1-SoC board specifications

- Altera Cyclone® V SE 5CSEMA5F31C6N device with 85k Programmable Logic Elements (PLEs)

- 800MHz Dual-core ARM Cortex-A9 MPCore processor with 1GB of DDR3 SDRAM

- 24-bit VGA DAC for image and video processing applications

- 5 User Keys, 10 User switches, 11 User LEDs, Six 7-segment displays

CAD Tools and Development Software

- Quartus Prime Development Suite (Version 16.0)
  - Qsys system integration tool
  - Nios II Software Build Tools for Eclipse
  - ModelSim starter edition
- Altera Monitor Program (Version 16.0)

Quartus Prime Development Suite (Version 16.0)

- Electronic Design Automation (EDA) Development Suite
- Includes all the tools required for design entry, synthesis, verification and simulation for Altera FPGAs
- Qsys - next generation System On a Programmable Chip (SOPC) builder tool
  - Provides drag and drop style interface to implement your design
  - Automatically generates HDL for the design
- Nios II Software Build Tools for Eclipse
  - IDE for development of programs on NIOS II softcore processor

Quartus Prime Development Suite

- **ModelSim Starter edition**
  - HDL simulation environment by Mentor Graphics included with Quartus Prime
  - Used for functional simulation of Verilog design

Altera Monitor Program (Version 16.0)

- IDE to develop assembly and C programs for both ARM Cortex A9 and NIOS II processor
- Helps in compilation and debugging of programs

Software installation

- The lab computers already have all the required software installed, but you may install them on your Laptops.

- Quartus Prime

  - Register at altera.com with your school email ID
  - Go to the download page (use version 16.0, newer version has bugs in windows)
  - Select OS (Windows and Linux only, no macOS version)
  - Select version 16 and direct download option
  - Go to 'updates' tab and select 'complete download' option
  - Follow installation instructions

- Altera Monitor Program

  - Download from here for Windows or Linux
  - Follow installation instructions

Questions