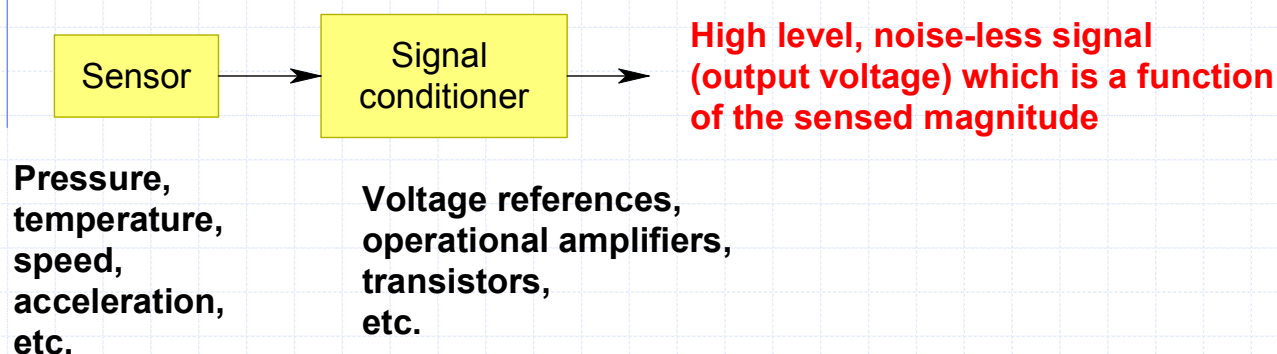


## Project design tutorial (III)

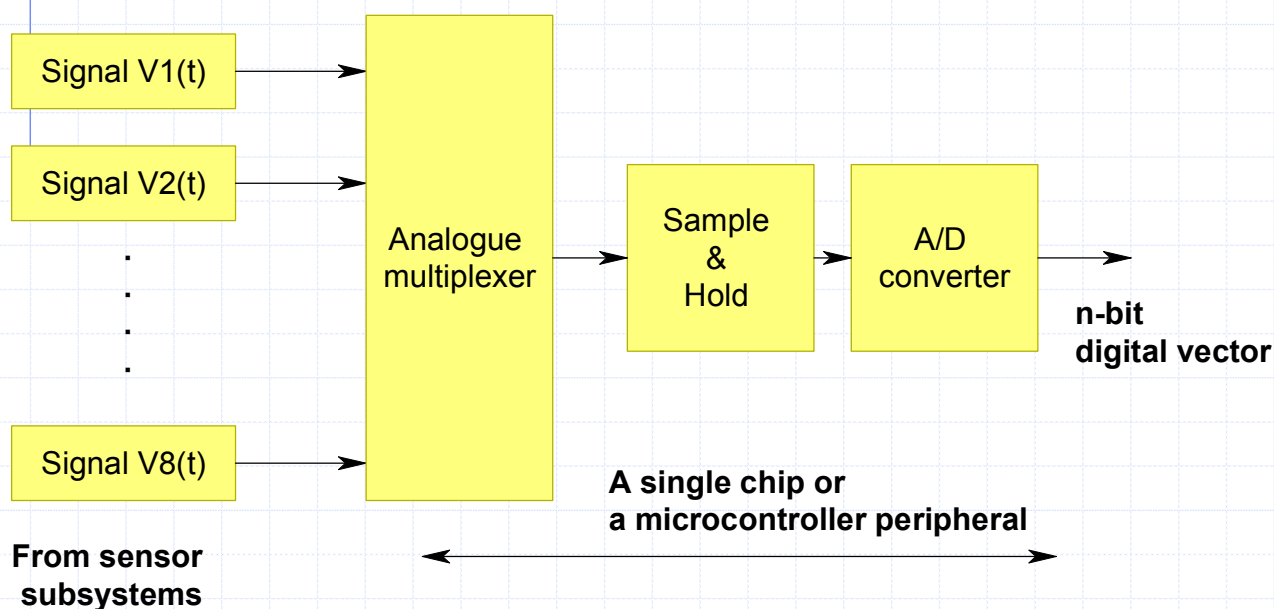
### Typical sensor analogue subsystem



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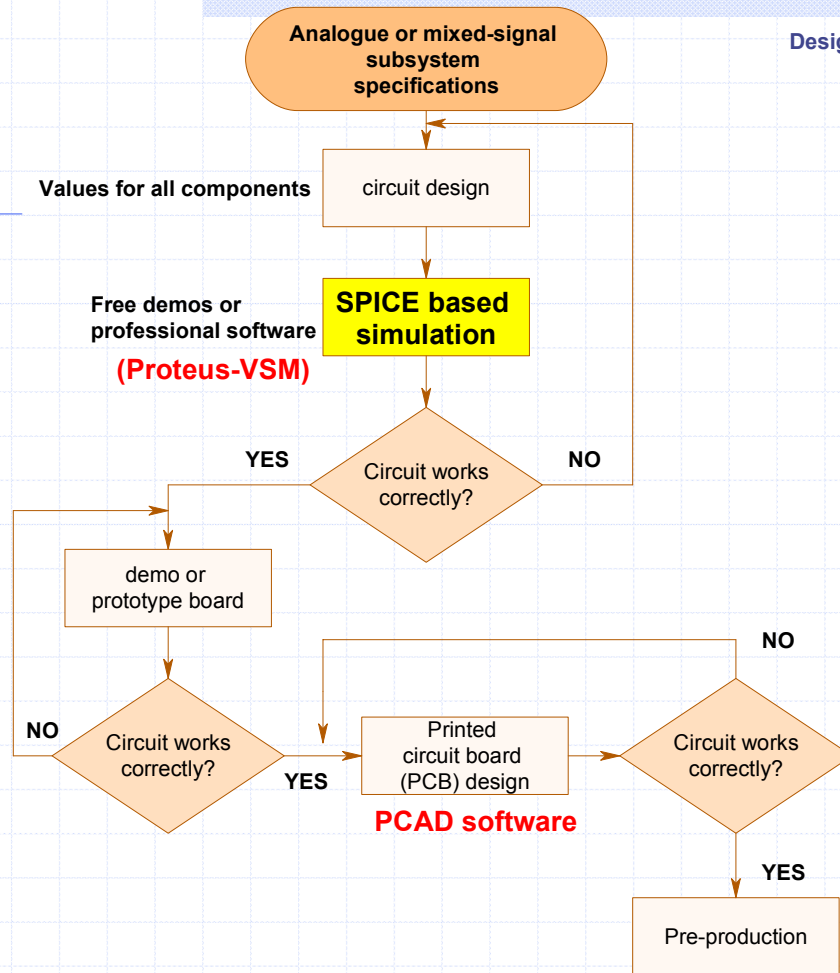
## Project design tutorial (IV)

### interfacing analogue signals



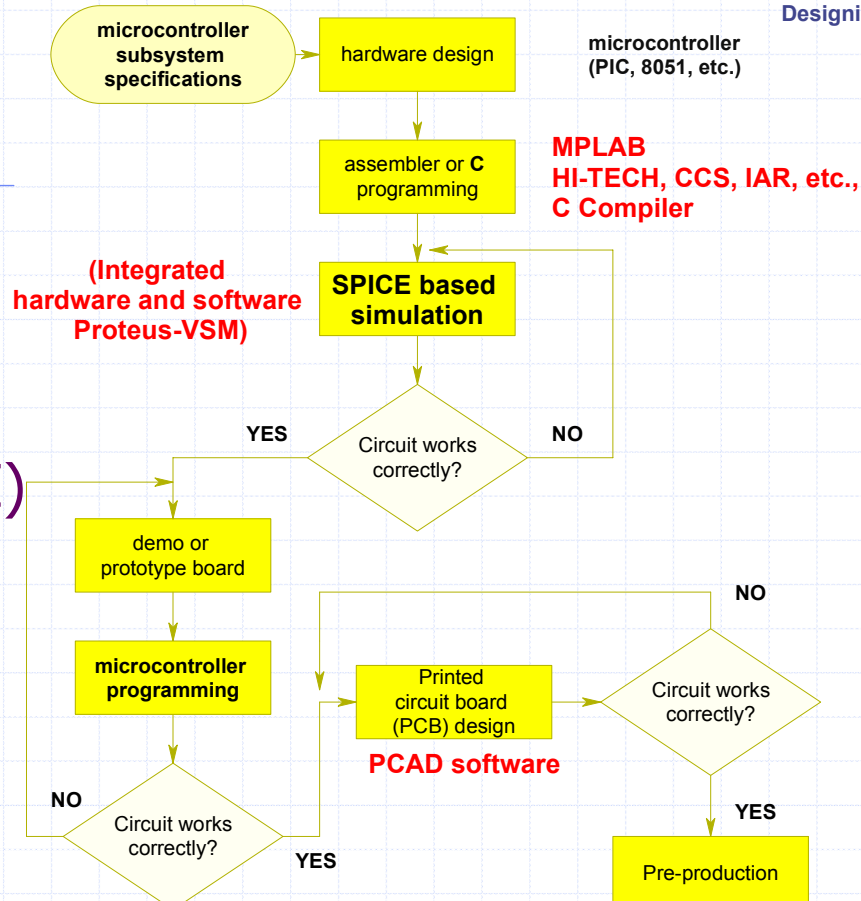
4

# Project design tutorial (V)



5

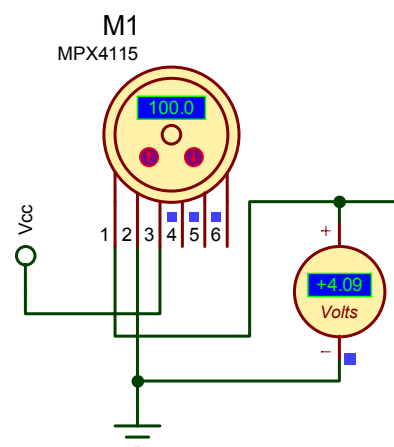
# Project design tutorial (VI)



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# An example: Initial design of an absolute pressure meter

- Specifications:
  - Pressure range from 900 hPa – 1100 hPa
  - 5 V power supply
- Data from the sensor datasheet
- Initial design of the sensor conditioner
- SPICE-based electrical simulation
- Microcontroller circuit and software design
- Prototyping



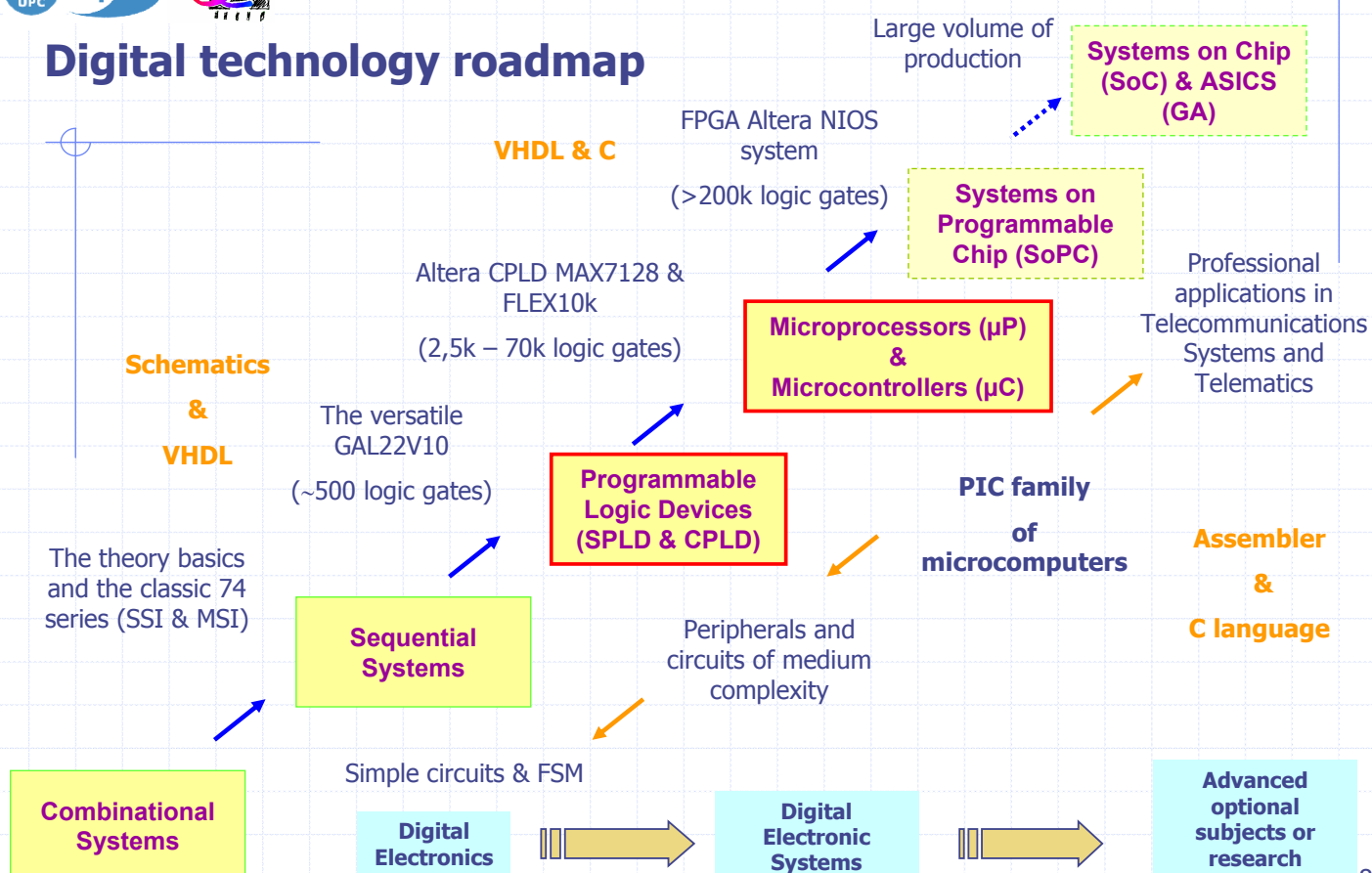
See the web page for details:

[http://epsc.upc.edu/projectes/sed/unitats/unitat\\_1\\_1/Unitat\\_1\\_1.htm](http://epsc.upc.edu/projectes/sed/unitats/unitat_1_1/Unitat_1_1.htm)

**Some concepts involved:** physical quantities, sensors, instrumentation, electronic circuits, simulation, analogue-to-digital interfaces, PIC microcontrollers, C code compiler

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## Digital technology roadmap

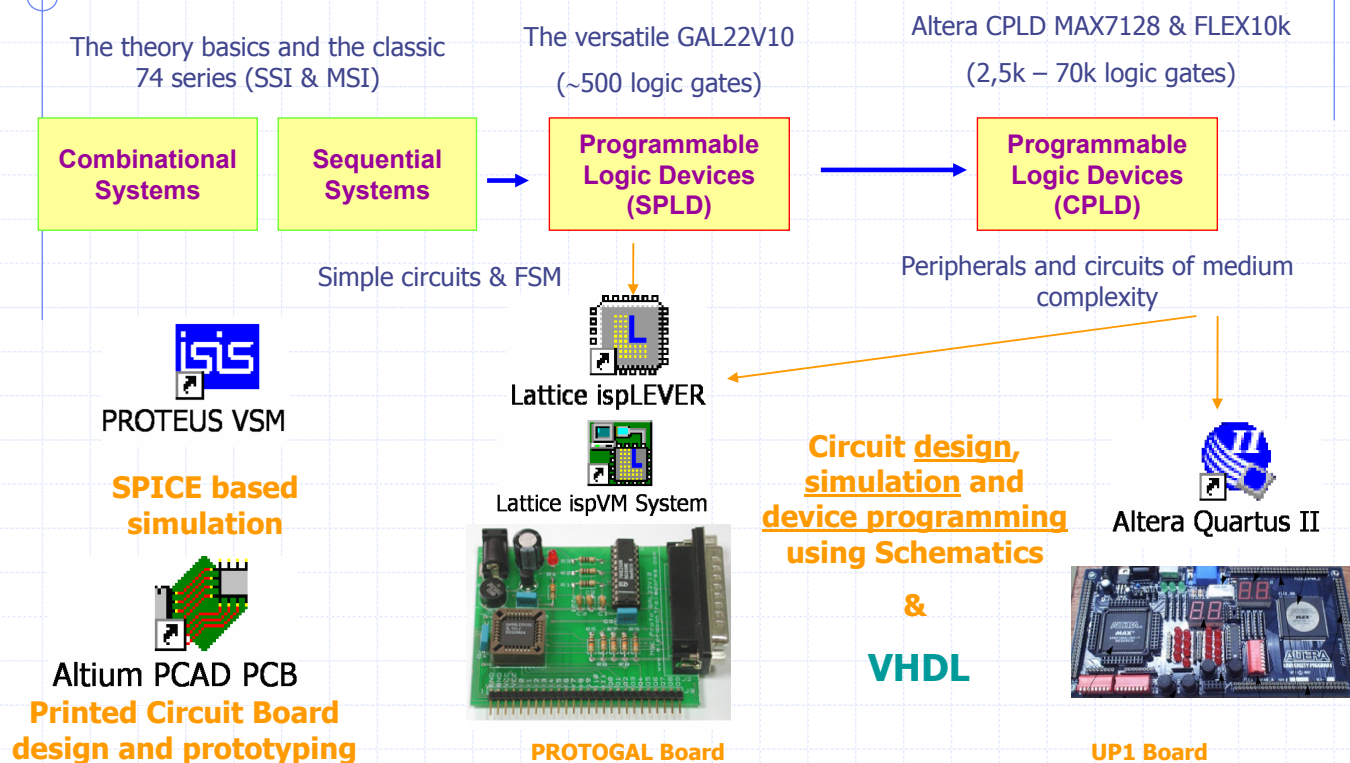


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# CAD tools for digital electronic design systems

## Chapter 1: PLD's



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## UP1

### Chapter 1: PLD's

#### LAB training for CPLD & FPGA systems

Foto from the internet, source:  
**Altera's MAX+plus II and the UP 1 Educational Board**

*A User's Guide*  
for

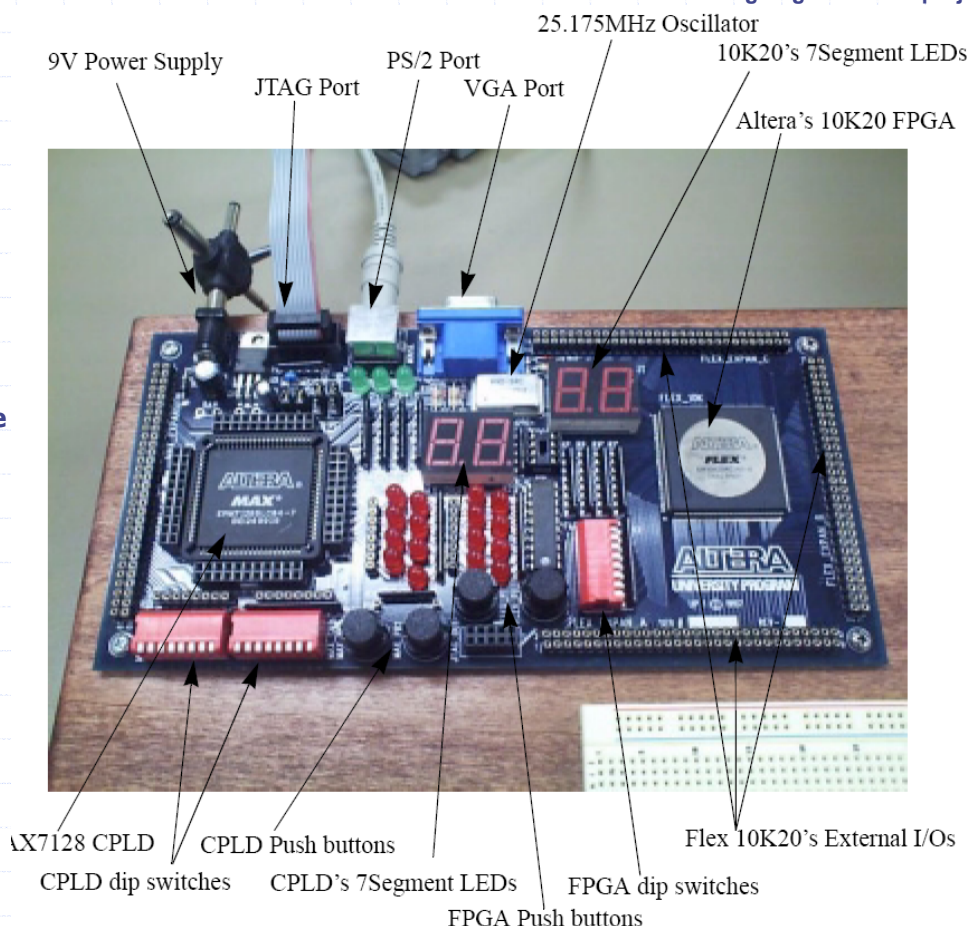
**Advanced Logic Design,**  
**CPE/EE 422/502**

**B. Earl Wells, Sin Ming Loo**

Department of Electrical and  
Computer Engineering  
The University of Alabama in  
Huntsville

Huntsville, AL 35899

Version 1, September 14 2000



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# CAD tools for digital electronic design systems

## Chapter 2: $\mu P$ & $\mu C$

### Microchip PIC family of microcontrollers



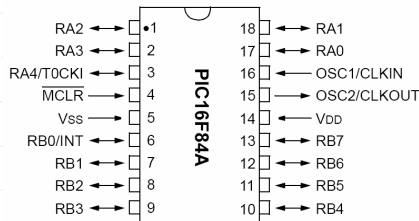
Microchip MPLAB IDE

Circuit design, simulation and device programming using

Assembler & C

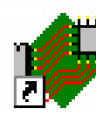
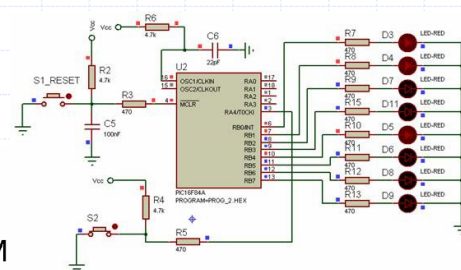


HI-TECH Lite C Compiler



PROTEUS VSM

SPICE based interactive simulation of microcontroller circuits



Altium PCAD PCB

Printed Circuit Board design and prototyping

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# PIC boards

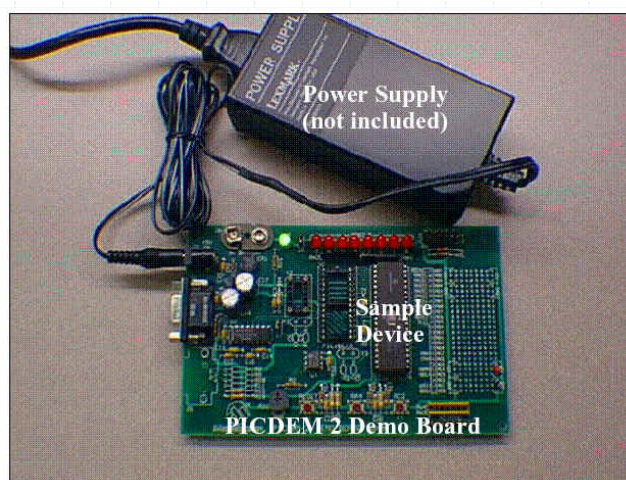
## Chapter 2: $\mu P$ & $\mu C$

LAB training for microcontroller systems



PIC Millennium Board

([http://www.elgarelectronics.co.uk/el\\_prod.html](http://www.elgarelectronics.co.uk/el_prod.html))



PICDEM2 board

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# CAD tools for digital electronic design systems

## Chapter 3: Systems on Programmable Chip (SoPC)

Professional applications in Telecommunications Systems and Telematics

PLD Altera NIOS system (>200k logic gates)



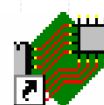
Altera Quartus II

**SoPC Builder**  
and device  
programming  
using  
Schematics  
&  
VHDL



Altera Nios SDK Shell

**C compiler and**  
**Shell for NIOS**  
**processor**  
**(serial port**  
**interfaced)**



Altium PCAD PCB

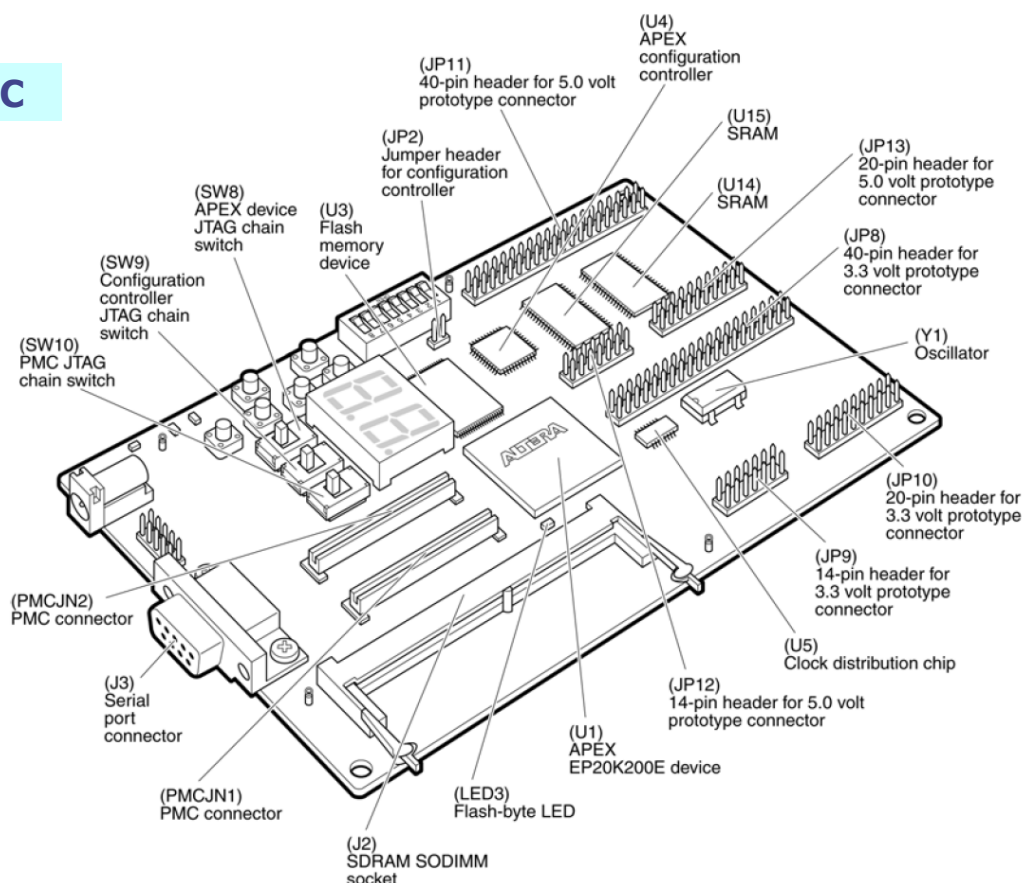
**Printed Circuit Board**  
**design and prototyping**

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## Chapter 3: SoPC

**NIOS**  
**Development**  
**Board**

**LAB training for**  
**SoPC based in the**  
**Altera APEX**  
**EP20K200E FPGA**  
**(484 pin)**



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- You must simulate and use as many as possible CAD-EDA tools before lab prototyping
- EPSC has many software licenses for you to use

Computer Aided Design (CAD)  
Electronic Design Automation (EDA)

Find some examples in  
<http://epsc.upc.edu/projectes/sed>