A Curricula for the Professional Branch in High Schools

Portuguese Professional Branch High Schools started in 1989

- They were established to fill a gap in the educational system - the inexistance of Professional Branch High Schools in Portugal;
- Students obtain a CE Level III Certificate and an equivalence to the 12th year of the Standard High School;
- The main objective of these courses is to prepare students to enter the work environment.

Professional Branch Courses have 3 areas:

- Cultural;
- Scientifical;
- Technical Technological and Practical.

Each course has a total of 3600 hours divided per 3 years.

50% of these hours are used in the Technical Technological and Practical area.

In the Technical Technological and Practical area The existing subjects are:

- Organisation and Architecture Computer Systems;
- Programming Languages Techniques;
- Structure, Organization and Database Systems;
- Computer Applications.

The name and number of hours of each subject are regulated by a Portuguese law.

The students may have as job output the following:

- Participate or be responsible for the choice of computer equipment for the company they work in;
- Develop software (Visual Basic, SQL, C, C++);
- Have know how to work with networks;
- Manage and do maintenance to the hardware and software of the company; installing Windows, Office, Antivirus programs, Infologia and do upgrades to the existing software;
- Sell Computer products

A proposal for a renewed Computer System Architecture curriculum is presented here, based on the research done and other countries' experiences.

Here are some examples of the research of school programs of others countries around the globe:

- In the USA
  - a Joint Task Force (ACM & IEEE/CS) was created to review the curriculum guidelines for undergraduated programs in computing revising the 1991 Computing Curricula – a final draft document was issued on October 2003;
  - ACM produced a Model Curricula for K-12 Computer Science, in October 22,2003;
- In many other countries, including Europe,Russia, South Africa,New Zealand and Australia computer science is being established according to the ACM K-12 curricula;
- In Canada, they provide 2 alternative tracks: one emphasising computer science and the other emphasising computer engineering;
- In Israel, they developed their computer science curricula also having as basis the ACM K-12 curricula

Another interesting approach is the PECTOPAH

Promoting Education in Computer Technology using na Open-ended Pedagogically Adaptable Hierarchy:

Three tools were developed in order to provide together a progressive hierarchy of teaching aids that can be used at different levels of teaching, providing students with an incremental toolbox.

A proposal for Computer Systems Organization in the "Informática de Gestão" Course

Focus on what is core for the course was done.

There is a major gap in the actual curricula as it gives more emphasis to the electronic and logic areas, that no longer respond to the needs of the "Informática de Gestão" Professional Branch high school's students.

For these students the most important issue is to understand how HLL are processed and transformed, instead of the particular aspects of what ,for example, is inside an integrated circuit.

The result is a gain in cost,time.flexibility, and adequacy to the requirements of students and their abilities.

Curricula Proposal contains 129 hours and has the following modules:

– CA-01. Computer Architecture (10)
– CA-02. Number Systems (21)
– CA-03. Memory system I/O devices (23)
– CA-04. Organisation and Internal Structure of a CPU (32)
– CA-05. Program Execution in a Computer (24)
– CA-06. Performance (12)
– CA-07. Future Vision of Computing (8)

– **CA-01. Computer Architecture (10)**
– CA-01a. History and overview of computer architecture (1)
– CA-01b. Fundamentals of computer architecture (9)

– **CA-02. Number Systems (21)**
– CA-02a. Binary, Decimal and hexadecimal system (2)
– CA-02b. Conversions between the various systems (5)
– CA-02c. Sum, subtraction and multiplication of two or more binary numbers (5)
– CA-02d. Sum, subtraction and multiplication of two or more numbers in the various bases (5)
– CA-02e. Signed and twos-complement representations (4)

– **CA-03. Memory system I/O devices (23)**
– CA-03a. Memory system organisation and architecture (8)
– CA-03b. Interfacing and communication (10)
– CA-03c. Device subsystems (5)

– **CA-04. Organisation and Internal Structure of a CPU (32)**
– CA-04a. Von Neuman Computer model (2)
– CA-04b. Processor systems design (5)
– CA-04c Organisation of the CPU (5)
– CA-04d. CPU function: instruction fetch, decode and execution (15)
– CA-04e. Evolution of computers centered in the evolution of the CPU architecture: from the 8085 onwards (5)

- **CA-05. Program Execution in a Computer (24)**
- CA-05a. Levels of abstraction: Procedures, functions and iterators as abstraction mechanism (8)
- CA-05b. Conversion of an abstraction level to the CPU commands: modules in programming language (8)
- CA-05c. Usage of a Computer Systems Simulator: discrete-event simulation, continuous simulation, verification and validation of simulation models (8)

- **CA-06. Performance (12)**
- CA-06a. Compilation (4)
- CA-06a. Disassemble (4)
- CA-06a. Optimisation (4)

- **CA-07. Future Vision of Computing (8)**
- CA-07a. High performance computing (8)

- **CA-05. Program Execution in a Computer (24)**
- CA-05a. Levels of abstraction: Procedures, functions and iterators as abstraction mechanism (8)
- CA-05b. Conversion of an abstraction level to the CPU commands: modules in programming language (8)
- CA-05c. Usage of a Computer Systems Simulator: discrete-event simulation, continuous simulation, verification and validation of simulation models (8)

- **CA-06. Performance (12)**
- CA-06a. Compilation (4)
- CA-06a. Disassemble (4)
- CA-06a. Optimisation (4)

The core knowledge should be expected to be present in all the programs.

Still it should be as short as possible allowing more time for the specialisation in the chosen area thus always maintaining the “broader picture”.

So, though important in other areas of teaching, the specific and deep knowledge of Boolean Algebra, Flip-Flops, sequential logic circuits, just to name a few should be taken out of this course curricula as proposed above.