Teaching students FPGA, DSP and microcontrollers in Samara University

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Nowadays teaching students requires much attention and care. Particularly it concerns technical courses, which should contain state-of-art technologies and methods. In electronics technologies and element base evolve extremely fast, and we need to follow these tendencies and include them into our courses. In digital electronics we also observe a sort of smearing standards and definitions, which require permanent refreshing courses and textbooks. Modern engineer, who want to be an expert in digital electronics should possess various techniques of digital synthesis, basics of programmable logic, microprocessors and DSPs, data interfaces and so forth. Hardware engineer should be a software engineer as well and vice versa, what means some changes in teaching in comparison with classic traditions.

However, using FPGAs and design of microprocessor systems as well as software engineering definitely require profound basic knowledge and here we have to find a trade-off between traditional approach and new ideas. Main problem here is the lack of time, which requires to sacrifice some obsolete issues, earlier considered compulsory.

In Samara University we offer students, studying radio engineering the course, including two main parts. First part is focused on hardware issues, electronic switches, Boolean algebra, basics of digital design, digital blocks like memory, ADC and DACs and programmable logic. Second part is dedicated to microprocessors and microcontrollers, including DSPs. This part includes also the main considerations on hardware and data interfaces. Hardware includes a block, dedicated to the interference mitigation and providing reliable operation. Significant attention is paid to software design. This block includes assembler and high-level programming using C/C++.

Recently we have introduced more elements, concerning FPGAs and specific high frequency digital design, which is likely to be important for hardware design. Using HDLs in fact changes the way of thinking, necessary for digital design. DSPs penetrate into radio receivers and software algorithms substitute traditional technologies in this area.

Moving in this direction is challenging to some extent, but unavoidable if we want to produce good engineers able to solve problems, relevant to the level of state-of-art technology. Another problem is the situation when some enterprises require specific skills and knowledge, often even obsolete. In this case we have to choose between comprehensive teaching and specific.

Technical education is always a tradeoff between traditions and novelties. Actually it is already common, that CPUs and MCUs become obsolete faster, than we include them into our curricula. From the other hand engineers need profound fundamental knowledge to meet new challenges and adapt to new circumstances.

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