

THE CONTENTS SELECTION OF TRAINING ON AN EXAMPLE OF THE MODULE "MICROPROCESSOR TECHNICS"

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The competency-based approach (C-approach) became a new methodology of working out of the standards in Russian higher education. It assumes reorientation of the content of education and the change of technology of its realization from passing on of set of knowledge and skills to formation of competences.

The structure, the content and the formulation of competence/competent were considered in publications of many Russian and foreign researchers: V.I. Bajdenko, G.E. Belitskaja, V.A. Devisilov, I.A. Zimnjaja, S.V. Korshunov, V.V. Kraevsky, P.F. Kubrushko, Dj. Raven, N.M. Rozina, J.G. Tatur, A.V. Hutorskoy, N. Homsy, V.D. Shadrikov, K. Bain, L. Dee. Fink, B.E. Walvoord, M.E. Weimer, etc. New principles of designing of educational programs and the organization of educational process on the basis of the C-approach were discussed in such magazines as "Higher Education in Europe", "Higher Education in Russia", "Higher Education Today", "Engineering Education", etc.

Time of development of the C-approach in the practice of engineering education has come. The training module "Microprocessor technics" enters such disciplines as electronics, automatics, computing and measuring technics, etc. Its urgency is especially high.

As known, designing of the educational module on the basis of the prognostic results of training expressed as competences, is finding a solution of a "back task" in the conditions of interaction of the C-approach with other approaches developed in pedagogic and psychology. We will consider one of solutions of the problem. Concerning the purpose and results of training we will lean on the C-approach, the content of training – on the system-based approach.

The training purposes of the discipline (module) at the C-approach are set by the competences which are formulated in educational program as the results of training. These results are expressed through such components as knowledge, skills and experience.

For example, as a result of studying of microprocessor technics the student should *know*:

- appointment and scope of microprocessor devices;
- the basic types of microprocessors and architecture of computers;
- microprocessor systems and microcontrollers;
- programming languages the Assembler and (or) C;
- the integrated medium for creation and debugging of programs.

Should *be able*:

- to carry out the proved choice of the microprocessor (microcontroller) for the solution of an engineering problem in the field of measurement, management and automation of technological process;
- to project the microprocessor device (its hardware and software);
- to debug its work.

Should *own*:

- skills of working out the microprocessor device for the solution of an engineering problem in the field of measurement, management and automation of technological process.

The C-approach orientation on the results makes comparable only qualifications, whereas the content of education including separate discipline (module) is defined by each university on its own, as Y. E. Babichev notices [1]. The competences orient a teacher on selection in the contents of discipline (module) of the practice-focused problems developing the student in the professional and social plan.

About selection of the content of the training module "Microprocessor technics". Solving this question, we based on factors known in the pedagogics, determining the content of training: the purpose and personal activity in the training process [2].

The purposes of the considered educational module are described above. Each of them corresponds the block of the content. We will define the dominant purpose which will unite these blocks. As in the future almost all technical devices will work under control of the microprocessors, which work on the basis of a software, so it becomes a necessary part of engineering activity to work the software out. C.A.R. Hoare wrote about it convincingly and figuratively: "Actually the nature and consequences of discovering of programming is even wider. It is like discovering axiomatic geometry by ancient Greeks - the basis for geodetic and cartographical activity, and then for designing and erection of buildings and bridges. It is like discovering of Newton's laws and differential calculus - the bases for astronomy, and also for such practical undertakings as navigation and management of artillery fire. It is like discovering the resistance of materials - the basis for reliable and an economical building of the ferro-concrete buildings, bridges and oil storages" [3]. Programming is often compared with art - its ability "to inhale life and intelligence into a dead semiconductor crystal". Therefore it is necessary to study the programming first of all. The textbook, in which the questions of programming in the Assembler language of the AVR-microcontrollers of Atmel Corporation were considered, has been written for this purpose [4]. We will explain such choice of the content.

The microcontroller (MC) of the AVR family of Atmel Corporation represents the 8-digit single-crystal micro-computer with the restricted (reduced) instruction set. It is intended for management by various objects and processes. MC contains the processor, the memory, parallel and

serial ports of data input-output, a set of the peripherals: timers/counters, analog-to-digital converters (ADC), pulse-width modulators (PWM), analog comparators (AC), etc. It is possible to construct on the basis of MC a multipurpose program-controlled digital system with inclusion of a minimum quantity of additional components.

According to Internet interrogation (<http://radioded.ru/>), which is held regularly since November 2007, MC of the AVR family of Atmel Corporation have received the greatest distribution. They take the first place in the world on a correlation the price/productivity/energy consumption and become the industrial standard. Programming of these MC can be carried out in two languages the Assembler and C in the medium of AVR Studio, which is free and always accessible on site of Atmel Corporation <<http://www.atmel.com>>.



What programs to develop? The programs, for realization of typical functions of control systems basing on the information technologies: converting of physical quantities into a digital code, input of the information from the sensor and the keyboard, processing of the information and its output on the indicator, the control by an actuation mechanism, and fulfillment of various laws of automatic regulation. So were determined structure and subject contents of the training module "Microprocessor technics" during creation of the textbook [4].

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