INFLUENCE OF ENGINEERING PROGRAMS ON ENGINEERING EDUCATION

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1. INTRODUCTION

Several compelling reasons and recent works such as [Revilla-Cuesta] and [Ortega-Lopez] have led the authors to analyze the situation of mechanical engineer education, especially in light of the great advances in computer-aided design and general computer hardware in the daily work of engineers, to propose trends in the curriculum so that it is harmonized with industrial requirements. The most important reason (reason 1) is the real significant level of unemployment among bachelor engineers in the Surkhandarya region [6]. The causes of unemployment may be associated with a reduction in production or bankruptcy of manufacturing enterprises. One of the main reasons is reflected in the knowledge engineers acquire during their studies. In the last decade, good students have chosen to study economics or law rather than technical subjects. Another reason (reason 2) is the lack of specialized knowledge, which is reflected in an increased demand for faculties and training centers for additional CAD courses (CAD, CAM, and CAE) [7]. These demands come from both employed and unemployed engineers, but often from older engineers. Young engineers rarely take CAD courses (CAD, CAM, and CAE) In addition to CAD courses (CAD, CAM, and CAE), there are often requirements for computer engineering courses (reason 3). Older engineers often seek basic computer courses, while younger and unemployed engineers seek advanced courses and programming skills [1]. Requests from companies for CAD courses (CAD, CAM, and CAE) are often caused by increased cooperation with foreign companies that use parametric assembly of parts and computer models in their production. Thanks to cooperation, our companies tried to use the CAD system

(CAD, CAM, and CAE) to take a worthy position in the global market [2]. Termez Institute of Engineering and Technology of Surkhandarya region, Faculty of Mechanics, Department of Engineering and Computer Graphics conducts special courses in object and network programming for unemployed engineers (reason 4). The courses are equipped and financed by the Termez Institute of Engineering and Technology. The question that may arise here is: Should taxpayers pay twice for expensive engineering education? It is not and is not necessary, especially for additional education [3, 4]. They pay highly qualified employees of the institute for the training of engineers, whose education should be as market-oriented as possible [5].

2. Current situation

Currently, at the Termez Institute of Engineering and Technology, at the Faculty of Mechanics, students can take several courses on computer technology, especially (CAD, CAM, and CAE). Based on the results of cooperation with such faculties, we can write that a very similar program exists in the mechanical engineering faculties of other universities and institutes. The only course dedicated to general computing is Computer Hardware. Its curriculum primarily consists of lectures on the procedural programming language FORTRAN. FORTRAN is a very good program, and it is difficult to find a FORTRAN compiler for modern operating systems (OS) on the open market. Its procedural nature makes it difficult to use the graphical user nterfaces (GFIs) of modern operating systems. GFI is usually implemented as a collection of objects and is sometimes even programmed in object-oriented programming languages. Apart from operating system programming, another important environment in which a program is developed is embedded applications. For example, if Visual Basic for Application® (VBA) is installed in Microsoft® Office®, the most popular system (CAD, CAM, CAE) - AutoCAD® from Autodesk even supports three programming languages: VBA, AutoLISP®, Visual LISP™. Interactive development environment. (IDE) and the most powerful ObjectARX™. ObjectARX is an AutoCAD Runtime Extension programming environment for developing custom AutoCAD applications. AutoCAD includes C++ libraries as building blocks that you can use to extend classes and protocols and create new commands that work the same as AutoCAD's built-in commands. All computational programming languages are object-oriented. Teachers often turn to engineers for help in developing special programs and applications. (CAD, CAM, CAE) course “Computer-Aided Design”. In it, students learn the basics of CAD systems and practice technical drawing, which is generally called 2D (two-dimensional) drawing

on a computer [6]. In most cases, AutoCAD is used in lessons. Considering the current situation, it is worth saying that in the “Engineering Graphics” course students use computers, but they complete all drawings classically. Several other courses cover more specialized areas of computer engineering, such as computer-integrated manufacturing, computer operations, and manufacturing management. Correspondence with several colleagues from foreign universities led to the conclusion that they also have similar programs. For example, Ph.D. Schützer, of the Laboratory for Computer Applications in Design and Manufacturing at the Methodist University of Piracicaba in Brazil, says her students often use an object-oriented programming language in their work but do not take such a course during their studies. BSME von Gildenfeldt from the Technical University of Darmstadt, Germany, gives the following interesting answers: Question: “Did you learn to program during your studies?” Answer: “Yes, all engineers do this in their first semester. I learned Fortran 77 (a few years ago), and now they're learning Java." Question: “Do you use an object-oriented programming language such as C++ in your work?” Answer: “Yes, of course, because my work mainly involves programming prototypes of scientific software. Question: “Is there a need for engineers with this kind of knowledge in your country/country?” Answer: “It’s difficult to answer. I think computer scientists are better suited to real programming. But mechanical engineers who can program can be employed in sales, project management, project definition, managing interfaces between departments in a software company, and others.” opens up good opportunities. Proposals for changing the curriculum of the Faculty of Mechanics.

3. Proposals for changing the curriculum.

1) First of all, it should be consolidated: basic knowledge of using a computer should be acquired at the beginning of training. Therefore, the author proposes to introduce a new topic in the first semester of study, in which students learn to work in the operating system. Works with Windows-based graphical user interface and standard office applications. The new topic can be called "Basic Computer Equipment" and the current topic can be called "Computer Hardware".

2) In engineering graphics, about 30-40% of the time should be devoted to teaching students how to use a computerized drafting system so that they can use advanced topics such as Elements of Machines I and II in their drafting.

3) Computer-aided design should be a compulsory subject and not an optional subject.

4) It is necessary to include a new elective subject in computer technology in the educational process. In it, students must learn to use the finite element method for engineering analysis and use it to solve real-life design problems using computer tools.

5) A new elective subject should be included in the educational process, for example, students will have to learn how to use computer tools for design, for the production process, for the production process, and quality control.

4. Faculty offers: open courses

The main idea of opening all courses at the faculty is that open courses are an opportunity for non-students of the faculty (for example, certified engineers, production masters, etc., usually citizens) to audition and certify subjects. At its discretion, the management should be offered the next academic year. Citizens will be able to listen only to the chosen subject without the obligation to take it; if a certificate is not needed, only new knowledge is needed. The corresponding certificate must be accompanied by an exam to confirm the acquired knowledge. Open courses can be very interesting for an engineer, manufacturer, or craftsman. Of course, the list of open subjects must be announced before the courses open.

5. Conclusion

The purpose of our article was to propose or highlight new trends in engineering education. For the reasons outlined in the introduction, critical voices can be the most powerful agents of change. Failure to make the proposed changes would result in two major undesirable consequences: insufficient engineering education and increased costs of undergraduate engineering education. An appropriate reaction that again leads to the reasons stated in the introduction. Therefore, corrective measures should be taken each time to prevent or at least reduce undesirable consequences. Changes can be made gradually or all at once. A gradual approach takes less time to implement and causes less reaction and confrontation. Revisiting the curriculum can be a good way to begin the process of continuous change.

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