Accreditation of Engineering Education Programs at Polish Technical Universities

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Abstract

In the paper the problem of changes in engineering education is discussed. On the one hand, there are precisely defined general academic standards for accreditation, but on the other one, there are job market expectations. To follow the expectation of graduates and employers, faculties must introduce continuous improvement processes based on outcomes measurements. The closed loop of the self-assessment process as a part of accreditation procedure is discussed. The accreditation commission for technical universities is also presented.

I. Introduction

Engineering education must follow the rapid diffusion of information, new technologies and the economy. That means that the curriculum ought to be flexible and faculties must care for it. Universities must move from a model of teaching to one of facilitating learning.

It becomes clear if we look at a typical employer interview. The employers emphasize that everyone can learn any job by continuous study, if he/she:

- is a graduate;
- wants to and can learn quickly;
- can work independently and solve problems;
- is interested in work and loyalty to an employer;
- is young, but has some professional experience;
- knows foreign languages;
- can easily work with others;
- is skillful with computers; and
- is flexible.

Let us pay attention that in the first place is the expectation of a higher education in general. The majority of employers indicate that universities can't prepare graduates for specific positions. From above-mentioned list it follows that employers expect from employees with a degree to quickly master a new job, be loyal, and work independently. They can also make easier for obtaining continued professional training for the employees by organizing special courses and/or paying for courses organized by someone else.

II. Accreditation Models

In a typical accreditation procedure, the general academic standards are defined: curriculum, program, faculty, facilities, administration, and operation. Based on this set of parameters, it is possible to see if an institution fulfills the general standards. In this case, we can look only for the license which is given by the government. The license is given by periodic monitoring of general academic standards – monitoring of inputs in educational institutions (Figure 1). In this model, the program is accredited if the —

Curriculum

- is balanced with respect to a general education (i.e., mathematics, science and engineering courses),
- gives preparation for technical practice,
- has appropriate engineering and technology standards,
- has appropriate sequences of courses, and
- has industrial aspects.

Faculty

- has sufficient number of staff competent to cover curriculum areas, and
- ensures program guidance, assessment, and development.

Facilities

- have modern engineering tools are available,
- have adequate classrooms, laboratories and equipment, and
- have a computing and information infrastructure.

Administration

- provides constructive leadership,

- has financial resources, and
- has technical and clerical service

The above model does not take into account student and employers expectations. To be accredited, at most one student must have graduated and found a job. However, the accreditation procedure should also take into account the opinions of the employers. Besides the normal academic standards expected by both students and employers [5], they are also looking for: an ability to solve problems, an ability to use theory in practice, team work skills, self-control and self-evaluation, strategic thinking, and an ability to complete a complex project. These features may be observed as outcome measurements of a program (Figure 2).

Now the most important problem is to define outcomes measurements. The expectation of graduates and employers are similar. The graduates should demonstrate:
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- an ability to identify, formulate and solve problems appropriate to the discipline;
- an ability to apply knowledge (mathematics, science, management, technology) in problem solving;
- an ability to design experiment and analyze and interpret data; and
- an ability to use modern techniques and tools in practice.

Other important features are:

- knowledge of ethical and professional responsibilities;
- understanding of the impact of engineering for modern science;
- an understanding of importance and commitment to life-long learning; and
- communication skills and teamwork.

Figure 1. Academic standards monitoring – open loop accreditation model.

Figure 2. Academic standards monitoring and outcome assessment process–closed loop accreditation model.

To obtain the above-mentioned features, it is necessary to review the program of study. The following programs objectives are usually listed:

- Provide an education necessary to enter and succeed in the professional career.
- Motivate students and graduates to develop knowledge beyond graduation.
- Develop both theoretical and practical skills of graduates.
- Provide up-to-date instruction in the professional area.
- Encourage research and creative endeavors.
- Be able to obtain professional license.

III. Accreditation Commission for Universities of Technologies

The accreditation commission for engineering programs named KAUT (Komisja Akredytacyjna Uczelni Technicznych) was establish by Conference of Polish Universities of Technologies Rectors on 17 February 2001 in Opole. The agreement was signed by 24 rectors of: Bialystok Technical University, University of Mining and Metallurgy in Cracow, Cracow University of Technology, Technical University of Cžêstochowa, Technical University of Gdañsk, Gdynia Maritime University, Naval University of Gdynia, Silesian University of Technology, Kielce University of Technology, Technical University of Koszalin, Technical University of Lublin, Technical University of Lódz, Technical University of Lódz, Branch in Bielsko-Biala, University of Warmia and Mazury in Olsztyn, Technical University of Opole, Poznan University of Technology, Casimir Pulaski Technical University of Radom, Rzeszów University of Technology, Technical University of Szczecin, Maritime University of Szczecin, Warsaw University of Technology, Technical Military Academy, Wroc³aw University of Technology, and the Technical University of Zielona Góra. The commission consists on 25 persons, i.e., the 24 delegates from each university and one representative of Conference of Polish Universities of Technologies Rectors. The accreditation procedure may be briefly described by the following steps:

1. Application (accreditation procedure starts with at least 5 applicants)
2. Standards preparation (definition of accreditation criteria given by experts)
3. Preparation of self-assessment report
4. Peer Review Committee (4 persons proposed by accreditation commission)
5. Peer review visit
6. Final report
7. Accreditation possibilities:
   a. Cive year accreditation
   b. Conditional accreditation for a two year period
   c. Non –accreditation

IV. Final Remarks

Engineering education must follow rapid changes in science and technology. Also the context of international changes is important. The engineer has the role of integrator, manager, leader and innovator. The context of engineering education includes economic, social factors based on good scientific background. In this context, the engineering education system must look for new solution. The university programs must be much more flexible, but still offer education at the respective level. The traditional open loop system of accreditation is focused only on the general academic standard — input measurements. Looking for new solution – the only possibility to obtain a higher level is to introduce close loop system which contains self-assessment process. This new accreditation philosophy is less restrictive concerning detailed quantitative requirements and provides more flexibility in designing of program and its objectives. Accreditation becomes an evaluation of the dynamic process of quality assurance in education.

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Author's Biography

Jerzy Swiatek graduated from Wroc³aw University of Technology in 1977 – M.Sc. Electronic Engineering. He did his Ph.D. at the Institute of Technical Cybernetics in 1979 and D.Sc. at University of Mining and Metallurgy in 1987 in Automatics and Robotics. He is a professor at the Institute of Control and Systems Engineering, Wroclaw University of Technology. His areas of research are: identification and modeling of complex systems;

identification of complex of operations; computer control systems; and adaptive control in complex systems. During the years 1993-1999 he was a Dean of Computer Science and Management Faculty. Dr. Swiatek introduced the ECTS system at the Wroc³aw University of Technology. He is responsible for quality assurance system at the Wroc³aw University of Technology. He is Vice-President of Accreditation Commission of Polish Technical Universities. Since 1999, he has served as the Vice – President for Education at the Wroclaw University of Technology.