



**FEANI ADDRESS AT THE OPENING SESSION OF THE  
7<sup>TH</sup> WFEO WORLD CONGRESS ON ENGINEERING  
EDUCATION  
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**A WAY TO THE INTERNATIONAL COMPARABILITY  
OF ENGINEERING EDUCATION**

Excellences, Distinguished Guests,  
Ladies and Gentlemen,

it is a great honour for me to present my speech in front of so many important people. Therefore, please accept my apologies if I welcome personally only the Vice-President of the Hungarian Parliament, Mr. Laszlo Mondur, and the President of WFEO, Mr. Kamal Ayadi.

Here, at this famous and traditional place, many wise people have taken important decisions. I hope that this spirit will help us to find good solutions for shaping the engineering education in the future.

Ladies and Gentlemen,

If we want to master the technical challenges of our modern world with its complex systems, we need well-trained engineers. More than ever, the focus must be on the aspects of sustainability in every technical innovation. It is beyond doubt that we see today all developments and innovations in the context of a global overall system. We should conclude from

**Introduction**

this that the education systems and contents must also meet international comparability. Especially in the case of engineering education, there is still a long way to go.

As a result of the growing areas of specialisation in engineering, a number of subdisciplines have developed. As the focus in many of these subdisciplines becomes increasingly narrow, engineers only concentrate on their area of specialisation. For the future, we have to change this situation.

The basis of the necessary engineering qualification is formed by a broad spectrum of basic elements comprising mathematics, natural science and technology. This fundamental knowledge is absolutely indispensable for understanding natural phenomena and their practical utilisation in technical applications, while at the same time serving as the foundation for building up consolidated knowledge in a chosen area of application. The broadest possible basic education is also an important prerequisite for professional communication skills between engineers and natural scientists.

However, understanding the basic elements alone does not qualify the engineer for the practice of engineering. In order to meet the requirements of daily work in the profession, an engineer also needs the consolidated knowledge from his chosen area of specialisation as well as the special skills of the problem-solving methodology of engineers.

## **Current Engineering Education**

## **Requirements of an Engineering Education**

Consolidated knowledge from the chosen area of specialisation enables the engineer to keep the overall scope of his duties in sight, to integrate his special problem-solving skills in the final solution and to master interface problems. In view of the growing complexity of modern devices, equipment and systems, increasing importance is being placed on the ability to “see the big picture”, to think in systems and to communicate on the systems level with everyone involved in a project.

The engineer of the 21st century is the perfect combination of innovations manager and entrepreneur. He is therefore able to run a company and to plan and achieve company growth.

Based on what I have said before, the core of the qualifications to be acquired in an engineering study programme should form a broad spectrum of basic elements with a solid education in mathematics, natural science, technology and interdisciplinary knowledge. All relevant courses in the study programme should fulfil this prerequisite and therefore lay the foundation for the professional mobility that will later be expected of the engineer on the job. Students must acquire during their education a broad spectrum of this basic knowledge, as this is very difficult to attain it later on in the practice of engineering.

### **Knowledge and Competence of an Engineer**

Classification of the individual subject areas leads to an optimal compromise in engineering study programme, as long

as the three basic education elements –mathematics, natural science and technical sciences - as well as a solid specialisation in an area of application, fill approximately 80% of the total study period. The remaining 20% of the study volume should be reserved for the teaching of non-technical courses in order to promote the interdisciplinary capabilities of the engineer.

It is especially important to supplement the theoretical part of a study programme with interdisciplinary and problem-related content. Theory and application orientations must be closely linked. The university must introduce in the course content more problem- and project-related study formats that also integrate technical and specialist content, as well as interdisciplinary study content. Therefore, it is especially important to intensify the cooperation between universities and industry as well as other cultural fields.

Currently, the comparability of engineering degree programme is based on the examination of the course content which is offered. Additionally, the duration of a study programme is used as a measure for achieving comparability. However, this does not take into consideration that the admission requirements in the form of school-leaving qualifications and the intensity of the course offer vary from one country to another. Despite this fact, at present only content and duration are being used for achieving the comparability of engineering study programme.

**Comparability  
through Quality  
Assurance**

If the engineering study programmes were changed in the way I have described before, the specialised content of a study programme will continue to be important, and examining this content will not cause any major problems. The duration of a study programme, however, will only play a minor role in the future. More importantly, the acquired knowledge and skills of the student must be assured and checked using output factors for engineering degrees. This output factors must correlate with the competencies of an engineer.

To determine those output factors is not an easy task. In a European project, named EUR-ACE, FEANI and 13 Partners have defined six output factors, which I would like to put up for discussion:

### **1. Knowledge and Understanding**

The consolidated knowledge and understanding of science, mathematics and engineering fundamentals are essential to satisfying the other programme outcomes. Therefore, graduates should not only demonstrate their knowledge and understanding of their engineering specialisation, but also of the wider context of engineering.

### **2. Engineering Analysis**

Graduates should be able to solve engineering problems, which may involve considerations from outside their field of specialisation. Graduates should be able to use a variety of

methods, including mathematical analysis, computational modelling, as well as practical experiments.

### **3. Engineering Design**

Graduates should be able to carry out engineering designs. The designs can be devices, processes, methods or artefacts, and the specifications could be wider than just technical.

### **4. Investigations**

Graduates should be able to use appropriate methods to pursue detailed investigations of technical issues.

### **5. Engineering Practice**

Graduates should be able to apply their engineering knowledge and understanding to develop practical skills for solving problems, conducting investigations, and designing engineering devices and processes.

### **6. Transferable Skills**

The skills necessary for the practice of engineering, and which are applicable more widely, should be developed within the programme.

Ladies and Gentlemen, let me summarize:

Today, we live in an age in which national borders no longer present restraints. We live in a global village and this applies

**Comparability  
not Equality**

most particularly to engineers and the engineering study programmes. In addition to teaching specialised knowledge, the modern engineering education must also provide students with a sensibility for non-technical aspects, like economic, social and ethical aspects. Contrary to specialised content, these aspects vary from one cultural region to another. For this reason, the comparability of engineering education cannot be defined only by specialised content and the duration of a

degree programme. In the future, the acquired knowledge and skills of engineering students must be proven with the help of output factors for engineering degrees. Achieving this goal is the responsibility of all engineers working in scientific and industrial sectors, on both the national and international levels.