

Post-graduate Engineer Education Program at PMMK, University of Pécs ICEE 2008

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Recent past... and present. Prospects and hardships of engineer education

It is a necessity for a good engineer to extend his knowledge while in practice. He needs to be familiar with the past traditions, the achievements of predecessors as well as the latest creations and structures of the present. At the same time, a good engineer needs to be prepared for future challenges, for facing the changes in his immediate and wider surroundings and far-away lands. In addition to his expertise in technical sciences and his own field of specialty, he needs to feel at home in the dynamic world of finance as well as in the ever changing labyrinth of legal regulations. A good engineer should get on well with people, even though they might speak different languages, and should also feel comfortable when surfing the world wide net with his fingers rushing along the computer keyboard.

It is not possible to meet these increased demands, unless we observe the world around with open eyes, with curiosity and make eager attempts to find out more about the cultures of distant regions, while continuously polishing our mind, updating our knowledge and proceeding well ahead of changes. The scientific careers of former engineers show that hunger for knowledge, curiosity, and the urge to fulfill expectations pushed them further on in their quest of self-education.

However, in the dense jungle of present day knowledge and information, they might not be able to progress much further on. Even the most desperate and dedicated ones might need to rely on outside help in order to find their way around and to get quick answers to their questions not mentioning obtaining the latest information in matters of profession, Social Sciences, Information Technology, Economics and Law while gathering, understanding and acquiring all the information needed to perform their duties.

Post graduate professional trainings have long been made available by educational institutions offering post graduate courses, specialist engineering courses, shorter and longer training sessions. 20 or 30 years ago, in the age of full employment, it hardly caused any inconvenience for the employers to send their employees on further trainings even during work time. Many of them volunteered to go back to school again since they received training and further assistance to improve their professional skills from excellent lecturers and practical trainers. A lot of them, however, did not feel the urge to join further training sessions even though being pushed by their employers. Their position was secure just as well as their salary and their job did not require much autonomy.

Before the democratic transformation, engineers used to work in enormous engineering offices at giant construction companies, or they were employed by institutions and enjoyed the advantages, disadvantages, comfort, prospects and dangers offered by being state employees. Knowledge just as well as professional literature and professional aids used to be readily made and provided for them. They were sent on study trips, attended conferences, their performance was controlled, their time scheduled, their colleagues selected and they were provided with protection when needed. Young professionals freshly graduated from universities did not have much to worry about. They were welcomed by employers, they were led into the company culture, trained to fill their future position, and their career used to be followed with attention. Major challenging tasks might have occurred but there would always be a dream team ready to cope with them.

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Famous and splendid products were created and, at that time, Hungarian engineering was associated with quality, good reputation and value. Although Hungarian engineers used to do high quality work, they did not have much influence on the realization of their designs as it was limited by poor financial means, as well as technical and technological barriers. On the other hand, a decent career, professional progress and a secure job was provided for them, of course, within the confinement of strict rules, limitations and supervision.

Some engineers of greater ambition, who were not satisfied with this comfort, sooner or later managed to set themselves free in order to fight their struggle for existence in another world and prove their skills and talent while contributing their knowledge and creativity to the values of another world.

Since then the world has changed around us, the pace is faster, demands, expectations, opportunities have all changed. We can not be sure anymore that the usual practice of proved value will still be working tomorrow. We must be prepared for rapid shifts, attitude change, good quality services and permanent development.

Now here is the opportunity to prove that, by knowing the past of the country and respecting the present we can provide our grandchildren a richer future. However this task requires more extensive and profound knowledge, more independence, creativity, attention, craving for quality and constant development from everybody. Qualified engineers might not find it easy to obtain a good job adequate to their qualifications, so many of them are forced to be self-employed at the onset of their career. But the new challenges require preparation as well in the course of graduate education as within the framework of post-graduate education.

In addition to the professional knowledge, a lot of **other competences** are in need: responsibility, ability to make decisions, precision, reliability, even-temper, good organisational skills, devotion, dedication, ability to deal with people, ability to compromise, ability to motivate, presentational skills, ability to work systematically, being practical, having a systems approach etc... Engineering education needs to be in compliance with all these requirements in order to prepare its students for the challenges awaiting them and provide them with a competitive spirit. Do we have the facilities to cater for all these: well-prepared teaching staff, receptive students, adequate set of methods, appropriate training time? The answer must be "yes" to all these.

However the time students spend in graduate education is rather short - on an average 3 years. This is a very short time to train someone to be an engineer, to shape the students views and attitudes. Even though the students do their "best" to spend as much time under the protective wings of the university as they can. There are several reasons behind this: some prolong their studies because the pace for them is too fast, some tries to make the most of what the university can offer and attend several educational programs at the same time, or, on the other hand, make the most of their youth: they have fun, do sports besides or instead of studying, and there are also some who need to take on part time jobs to be able to finance their studies. When it comes to the question of the organisation of education and teaching methods, we need to take all of these into consideration, as the regulations make this easy going attitude to studying (or not learning!) possible. During the 3 years of studies, the optimal amount of time a university tutor can calculate with is about 20-24 contact lessons a week per term (in 14 weeks time).

It is obvious that in such a short period of time it is impossible to gather a profound knowledge in each field. It is not possible any more (as it used to be) to train specialist in the course of elite education as the general tendencies of education incline towards mass education, in the direction of general training. **Today's challenges** have transformed higher education as well. To quote the words of PhD János Bársony, the previous vice-president of Pecs University who was, at the same time, the previous dean of Mihály Pollack Faculty of Engineering: "Nowadays, we have to accept and acknowledge the right of the society to intervene with the trends of higher education. The linkage which is developing between society and university education is a fact of modern life. ... One of the major challenges of our day is globalisation. The ever growing global economy is leading to the formation of a global society which entails the globalisation of higher education as well. In other words, it induces global competition between universities and, doing so, it also generates a quality contest..... Education strategies mostly focus on the task to convert a professor-centered education system into a student-centered, education-centered system. In Hungary, there is a strong nostalgia for traditional values and a trend to recall the memory of great polymaths and school founding

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professors. Nowadays, every country is striving for directing the growing number of students towards higher education, while hoping for the institutional costs to drop at the same time. The question here is whether, considering the conditions, the widening quality gap can be bridged over at all. Not by mere chance has the question of quality become a central issue in higher education. Our traditional educational system is not sustainable any more. It is a fact that the invested educational energy has decreased, and the lovers of the past only hinder the modernisation of the system.

We are continuously detecting these changes: the number of students entering higher education has multiplied, while the teaching staff are shrinking and slowly getting older. The young, recently graduated professionals are not so willing to cope with the demands university lecturers have to meet nor the modest remuneration, the increasing expectations, growing work load awaiting for them in education. Due to the demographic setback, the number of students entering secondary and higher education is growing in proportion, a fact that projects the oncoming decline of quality standards. The growing numbers of exam failures and unsuccessful subject registrations also indicate the problem. It is not the university lecturers who have become stricter! **The credit system** allows for a greater freedom and flexibility: students nowadays can easily prolong their studies, they can fall behind with the accomplishment of certain subjects, the fulfillment of academic assignments can be attempted several times. The structure of the academic curriculum provides the students with a comprehensive, wide spectrum picture of engineering and the chosen specialty, but due to the insufficient amount of practical lessons there is not much chance for the students to be deeply immersed in one or two subjects, to master subtle skills in any area of special knowledge. The only time that allows for deeper research work for the first time is the period of thesis preparation.

However useful and necessary they are, organising **summer work practice opportunities** (internship trainings) is also hindered by difficulties. There are no major companies available, and it poses considerable strain on smaller companies, small size planning offices to welcome one or two students and tutor them, train them and keep them busy for four weeks. There is no capacity, no space, no opportunity nor intention to do it. This way our students are excluded from the real world practice, the buzzing life of professionals. It is a possibility for only a few (the most desperate ones) to find an appropriate place for internship with the helpful intervention of friends and other connections. Considering the lack of professional practice opportunities, Pollack EXPO, a job fair that has recently been organised on a fairly regular basis, has had a rather beneficial effect on the training of architects and engineers. The EXPO provides the students with an excellent opportunity to get in touch with companies (mainly on the field production and sales) and to build a, hopefully, long term relationship. For architects it is a bit easier to find internship opportunities in planning offices as they always need fresh, new eyes to operate computer aided designer programs. In case of other special fields of engineering, there is a lot less demand for trainees.

The credit system requires **excellent infrastructure** to operate well. Institutes of higher education that can not ensure quality infrastructure will already be at disadvantage as early as the time of university entrance exams. Students are not eager to study in run down buildings. Moreover, to be honest, it is hard to make students accustomed to quality work performance and educate them to have a demand for quality in poorly equipped facilities. From this aspect, the Faculty of Engineering has made a huge leap forward with the reconstruction works financed within a PPP construction. Renewed infrastructure, renovated buildings of a fresh look and modern furnishing offering educational and student hostel functions welcome students with motivating environment and inspires them to new ideas. Hopefully, the renovation and refurbishment of the laboratory equipment will also be part of the renovating program, as no successful engineer education can be envisioned without practical training. Unfortunately, the course syllabus does not allow for emphasising practical training and the financing background of the courses is far behind the requirement. This lack of practice can only be filled in after graduation, in the course of employment, or maybe during post-graduate training programs. Grants are welcomed as a great help for education, but writing and preparing grant applications deploys resources of the institution to an undesired extent.

What makes education high quality? The Hungarian Accreditation Board, which enumerates only lecturers with academic degrees among its members, and grants the official approval for the training programs, usually examines the personnel and infrastructural facilities of an institution. Thus the theoretical, academic aspect is emphasised again, while the engineering practice and the professional requirements are

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pushed into the background. The interests of the students are effectively represented in the university's governing bodies by numerous student representatives. It is questionable though how profound their judgment is when it comes to judging correctly the long-term interests of the students. The increasing number of students accompanied by the decreasing funding opportunities of institutions certainly does not improve quality in education. Every opportunity needs to be grabbed to strengthen the relationship between higher education and everyday business practice, as only engineers who perform well in real life situations can initiate the necessary development.

What can the freshly graduated engineers do with their degree? Although engineers are badly needed, it is not easy for a young engineer to find his place immediately there and then when he wants to. As it happens, a lot of them can only partially graduate, as their diploma is not issued until a language exam is accomplished. No diploma no professional entitlement. Being only "half-graduate", one can only find low paid jobs of drudgery. While some students only attend the university to obtain a degree, as being a graduate has its advantages when applying for a sales or managerial position. Some students choose to carry on with their studies in the field of law, economics, or politics, which provides them with a very well utilizable knowledge and attitude. And after all, it is beneficial for all of us, if the politicians, economists and lawyers of the country have a strain of engineering mind in them!

Why has post-graduate engineer education become so important?

First of all, those **who have actually found employment as engineers** need to be familiar with the legal background and conditions of how to be entitled to carry out planning work, perform technical inspections, to be responsible for technical control, or to provide experts advice in a responsible manner. The diploma alone does not qualify to do any of these! The practice of the profession is controlled by a government decree (104/2006 IV.28.) and the resolutions of the Chamber of Engineers. The entitlement to perform professional work is granted by the local engineering or architect chamber, and the entitled person has his name registered in the directory of engineers. For this

- one needs to be a member of a chamber. In certain cases registration is sufficient i.e. in case of technical supervisor, construction technical inspector.
- one needs to have a degree in a special field of engineering
- one has to present proof of professional practice carried out in compliance with the government decree
- its entitlement needs to be examined by a examination board appointed by the professional chamber, or an exemption from examination needs to be presented

The **entitlement examination** is performed by the national professional chambers and it focuses on professional knowledge in connection with different fields of professional practice i.e. by testing the applicants familiarity with legal, financial, standardisation and QA-QC aspects of engineering. One can prepare for the exam individually, but there are preparation courses organised by the chambers as well. Depending on the speciality of the certificate and the technical content of the planning activity, the chambers usually issues a **permit with limited scope of planning** until the applicant accomplishes the required 5 year-practice.

The entitlement is to be renewed every 5 years. In order to do this, the person needs to prove the accomplishment of a **professional post-graduate training course** as specified by law. The post-graduate training consists of two parts. The first part includes the **compulsory syllabus**: legal, financial, standardisation and QA-QC information. The course can be done either in classroom or in distant education form with a number of lessons ranging from min. 10 to max. 20. In this part, in accordance with the intention of the chambers, the aim was to convey information obligatory to use in engineering practice (effective legal regulations) The **second optional part** (values 20 credit) includes optional programs of courses organised by the chambers, post-graduate courses, post-graduate specialist training, PhD courses, to lectures, exhibitions, conferences, professional educational trips but even individual performance is acceptable i.e. in form of making plans or giving lectures. The credit points are defined by the chambers upon the submitted syllabus documentation and requests. 20 credit points have to be collected within 5 years. Naturally, the credit points

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received here are not identical with the credit points received in higher education. There is no exemption available, so engineers over 60 have to meet the demands if they wish to carry on practicing.

The **first post-graduate training period** started in the first quarter of 2007. It was 1.5 years ago when we started and there are more and more people wishing to take part in the training as there is a continuous need to renew entitlements. Initially, there were a lot of requests for explanations coming from engineers wishing to renew their entitlement which kept the administrators of the local chambers busy. Mainly the elder generation felt a bit resentful by the new testing system. This was not what they deserved after having been in practice for several decades, they thought. However, it was mostly them who participated most actively in the lectures, overwhelming the lecturers with questions at the end. Many of them have openly admitted that they found the post-graduate training useful, and it is really necessary to get familiarized with the novelties of the trade from time to time, analyse the new statutory regulations, and find their ways around in the labyrinth of resolutions, regulations and standards.

The Hungarian engineers have organised themselves into two professional chambers. Architects and urban engineers mostly opted for the Chamber of Hungarian Architects while others have joined the Chamber of Hungarian Engineers. Several of them, mostly architects and civil engineers have joined both Chambers as they were obliged to do this due to their planner, expertise and other entitlement requirements. The post-graduate training requirements stipulated by the chambers were not entirely compatible with each other in the first year. Fortunately, the situation had changed by the 2nd year so the engineers with double chamber memberships had to attend one training session only once, provided its program had been accredited by both chambers.

By now, the majority of the engineers is well aware of their post-graduate training obligations and is willing to cooperate. The Chamber of Hungarian Engineers participates in the training as well, and it organises compulsory post-graduate trainings for their local divisions' members. In addition to this, institutions of higher education and adult education as well as private persons have accredited training programs. The attendees of the post-graduate training courses organised by the chambers are only required to pay a symbolic fee, while the other course organisers apply market compatible prices. Some manufacturers are still capable of organising lectures for free, but the marketing effect of the event counterbalances the joy of free participation. In our opinion, the **Alumni** certainly has a place to fill in on the field of professional education.

Former students are glad to return to the place of their education, and many of them already have children who graduated from the same institution. On the occasions provided by the training course, there is a chance to meet old friends, former colleagues, and the professionals of the region. That is why we decided to set up the Pollack Post-Graduate Engineer Training Center in the spring of 2007, mainly to fulfill the needs for Post-Graduate Engineer Training. But before we would proceed on to say a few words about the past year's experience, let us take a look at the history of Post-Graduate Engineer Training in Hungary.

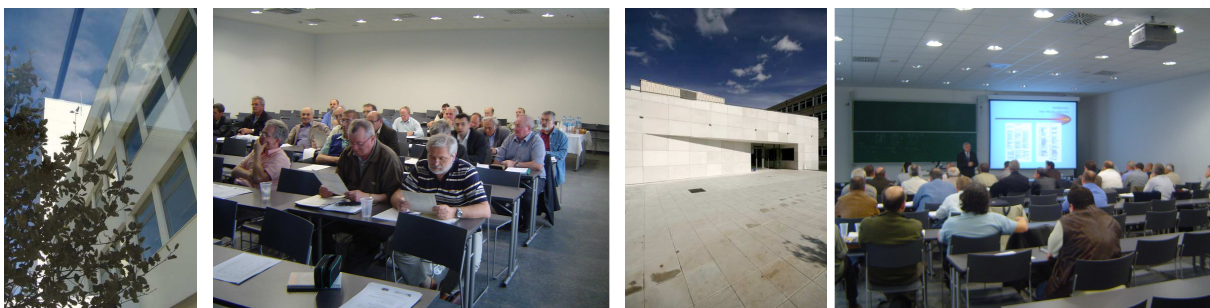


Fig. 1. Post-Graduate Engineer Training in the renovated building of PMMK

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The past and present of graduate and post-graduate engineer education in Pécs

The beginning of technical education in Pécs goes back 46 years, as far as 1962. The higher technical colleges were set up in 1960 by a government decree with the aim to provide opportunity for further professional development for young people bearing only a GCSE, or a technician qualification. The 3 year-training was almost at university level, and the graduates never had any problems finding a good job. The industrial development of the country demanded technical professionals in great amount. At that time, the high level and up-to-date approach of the education was ensured by the great number of lessons (38-40 lessons per week!), the well prepared teachers' staff, the available university textbooks and the rapidly edited educational hand-outs.

The higher technical college education was terminated in the 1970s, at the same time as the secondary level technician training, which was replaced by the system of secondary comprehensive education.

Managing planning, research, development, and production at a higher level required university level education. Additionally, there was a growing demand to replace advanced level technicians. This gap was to be filled in by technical college graduates. In 1970, as a result of a big scale construction carried out in a very nice area of Pécs, the building of Mihály Pollack Technical College was handed over. The new institution was named after Mihály Pollack (1773-1855), the leading figure of Hungarian architecture, who designed several public buildings, churches, and country mansions in the 1800s, excellent pieces of architecture gaining him fame all over the world. In 1974, our school issued the first production engineer certificates to the freshly graduated construction and civil engineers.



Fig. 2. Mr. Mihály Pollack and the building of the National Museum (Budapest) designed by him.

After 1990, the production engineer qualification ceased to exist. Those who graduated after 5 years of university studies received the title of "certified engineer" while those finishing the 3 year college education were issued with the "engineer" title supplemented by a reference to the relevant field of specialty. In addition, the former civil production engineers were awarded with the title of civil engineer while the former architectural production engineers were given the title of architects. The naming might be misleading, since the college graduates also received a certificate, however not the "certified engineer" title. On the other hand, a lot of people including employers and clients, were not even able to distinguish between the two qualifications.

The college joined the university in 1995, and by this gained a new name and turned into the Technical College Faculty of Janus Pannonius University. The name of the university was changed into University of Pécs in 2000. Due to our union with the University, and following a successful accreditation procedure, the university level architect education, later, as of 2002, the university level civil engineer education was launched. As of 2004, our institution is a proud bearer of the Pollack Mihály Engineering Faculty (PTE PMMK) name.

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Our Faculty with its several thousands of students is one of the biggest, and most colourful educational institution of technical higher education in Hungary and a dominant center of the Trans-Danubian Region's engineer education.

The onset of engineer training in Budapest and Pécs

The idea of organising formal **engineering training was raised for the first time in 1914 in Hungary**, then, **in 1939, a post-graduate engineering training institution was established in Budapest, the first of its kind in entire Europe**. It was Prof. Géza Ábrahám Pattantyús, who, on the national engineering congress in 1931, addressed the importance of post-graduate training for the first time. The names of Prof. Győző Mihailich and Bálint Hóman, the Minister of Religion and Public Education, also need to be mentioned as they were the ones who actually carried on and realised the idea engineering training in reality. Since it was established, the Institution has been striving to maintain a high level and up-to-date education, to provide the students with educational services and necessary textbooks. As of the 1970s, the institution has made a rapid headway having, in certain years, as many as 23,000 students attending its training programs. 10 years later, mainly due to the declining economic environment, there was a considerable drop in the interest in traditional engineer training programs, which revealed the need for new type trainings. Besides engineering sciences, there is a growing demand for subjects such as economics, politics and management. Meanwhile, foreign language education has been launched for Hungarians and foreigners as well.

In Pécs, it was not before 1984 that professional post-graduate training programs became available at the Technical College. A secondary degree in specialist production engineering could have been attained after graduating from a 2-year training course. This qualification, however, did not have much value apart from its prestige, as this 3+2 training could not compete with a 5 year university education. Notwithstanding, the course was fairly popular among students who attended these high quality training sessions in great numbers.

At the moment, the Pollack Faculty of Engineering offers several training programs in the form of specialised **post-graduate studies** i.e. enterprise manager, logistics manager, project manager, product developer, environment control specialist, QA-QC. As of 2001, the technical inspector qualification was linked to the accomplishment of a training course (specified in OKJ, National Trainings Register) including the exam. From the very beginning, our Faculty has been organising training sessions and exams in this field.

The first year of Pollack Post-Graduate Engineer Training Center

In September 2007, our **compulsory and optional training programs**, as specified by regulations of the chambers, were launched within the institutional framework of **Pollack Post-Graduate Engineer Training Center** in Pécs and in other major cities such as Zalaegerszeg, Budapest, Szekszárd and Székesfehérvár. There has been a steady increase in the number of participants since 2007. In the first year more than 1,200 students attended the training program. At the beginning, not many participants were well informed about the post-graduate training requirements complying with the regulations issued by the professional chamber, and at the moment, although there has been a slight improvement, half of the participants are still under informed. People usually have to face the requirements when they pay a visit to the local chamber in order to renew their entitlements. The former students of PPMK seemed to be glad to return to the Alumni's recently renovated building for some mental refreshment.

The compulsory part of the training has been accredited by the professional chamber. Considering that only 18% of the applicants have an entitlement certificate (mainly technical inspector certificate) it is not easy, from an organisational point of view, to divide the training program. The first qualified technical inspectors graduated 6-7 years ago. Since then, there have been considerable changes in the field of construction industry regulations. First and foremost, these important elements have been placed in the center of the classroom activities. In addition to this, we have prepared an information package on the legal background which is available for everybody via the Internet and also very useful for every practicing engineer regardless of them having any entitlement exams or not.

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At this level, it is not easy to find an appropriate lecturer since not many of them are capable of transferring up-to-date knowledge regarding the continuously changing professional, legal and financial information in an enjoyable way. And those who meet the requirements are usually short of free time. In spite of these obstacles, we have managed to deploy excellent lecturers mostly from the university staff. These lectures are not only involved in teaching, but they also run their own business which provides them with a significant amount of professional experience. The well structured, interesting and useful lectures have, from time to time, received well deserved applaud of the audience at the end of the lessons.

It would be worth to consider how to utilize and coordinate more effectively the available teaching capacity within different educational institutions. It is especially difficult to organize lectures in the case of extra-mural courses as the travelling costs of lecturers, the room renting fees and the local organisational time makes the program rather costly. The lecturers have a complex task to give a comprehensive overview on a vastly extended and diverse topic in a very short time while addressing their lectures to a rather mixed audience. It would be advisable to provide the different target groups with separate consultation opportunities, but due to financial reasons, this is not yet feasible.

A lot of people are still weary of **distant learning**. There is still a significant number of people who refuse to use computers. However, based on our experience, this is the method of information transfer that needs to be developed mostly by developing appropriate teaching materials. It would be very useful to share all the valuable teaching materials having been developed in different workshops, chambers and research centers. It would be nice to find some sources of funding for this project in order to avoid the double work and waste of energy of developing the same educational material at different places.

According to the feedbacks and questionnaires, these post-graduate training sessions were useful. Most of the professionals accepted the idea of training; moreover, they require information, further training opportunities, even on-line counseling in connection with different professional issues. However, financing the preparation of lecturers as well as the compilation works on on-line teaching material is almost impossible from internal sources. It was an immense help for us to receive about 32,000 Euros in the form of two successful grants from the ministry dealing with professional education. This money was spent on preparation for the training program and on the development of teaching materials.

The Engineering Training Center even managed to allocate some money from its first year income to contribute to the rewarding of 10 graduate students apart from covering the training costs and the lecturers' fees.

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