POST-GRADUATE EDUCATION IN ENVIRONMENTAL ENGINEERING AT THE TECHNICAL UNIVERSITY BUDAPEST

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Environmental protection requires environmental specialists that are, however, insufficient in themselves. For this reason, the whole educational system has to be penetrated by a correct and uniform approach to environmental protection and, on the other hand, environmental engineers are to be trained.

In the Hungarian higher education, emphasis is laid on forming and developing a correct environmental approach and on teaching the necessary knowledge in right proportions. Of course, formation of a correct environmental approach is not the task of higher education alone but it should begin in the primary school and continue in the secondary school.

Environmental engineering courses are incorporated both in undergraduate and post-graduate programs of the Technical University Budapest.

Environmental problems are mostly incorporated into courses delivered by each Faculty at its undergraduate courses. The courses of water management and water pollution control have the greatest traditions, but also air pollution control, noise reduction and soil conservation are integrated in different courses. At the Faculty of Architecture, the course "Settlement planning", includes among others environmental engineering at a regional scale, environmental aspects of settlement and industrial area siting. "Environmental engineering" is a special course in the new curricula of certain branches of the Faculties of Mechanical Engineering and Chemical Engineering. At the Faculty of Transport Engineering, "Traffic Acoustics" is a self-contained, optional course.

Post-graduate training of engineers

In Hungary, post-graduate environmental engineering education became both imperative and urgent, because many engineers already were in need of environmental knowledge in their work. For the post-graduate environ-

mental engineering education — in addition to self-education, — there are two main possibilities available:

1. programs organized by the Institute for Post-Graduate Engineering Education of the Technical University Budapest.

2. Two years' post-graduate programs for a "specialist engineer's" degree offered or to be offered at different technical universities in Hungary.

Programs organized by the Institute for Post-Graduate Engineering Education of the Technical University Budapest, in Budapest and in other major cities supplied many engineers readily utilizable environmental knowledge in general or in a given field. These programs are sponsored and/or coordinated by the Council of Post-Graduate Engineering Education.

The other ways of post-graduate training in environmental engineering are the two-year degree programs organized separately by the Technical University Budapest, the Veszprém University of Chemical Engineering, the Technical University of Heavy Industry, Miskolc and the University of Agricultural Sciences, Gödöllő, each according to its field of speciality. (Undergraduate training of engineers takes 5 years in Hungary, and after having practicized for two subsequent years the graduate may attend a two-year part-time program for a "specialist engineer's" degree.) The training consists of four 13-week terms, 12 lectures a week as an average. It is compulsory to attend the practical training.

It should be pointed out that training in environmental engineering is not offered by specialist engineer degree programs at technical universities alone but also by those of other technical and agricultural higher education institutions, if not necessarily under the heading "environmental". For instance, the "specialist engineer" degree program "Water supply, Drainage and Hygiene" at the Faculty of Civil Engineering, Technical University Budapest is a direct contribution to environmental engineering.

At the Technical University Budapest, "specialist engineer" training in environmental engineering was launched in February 1974 by the Faculty of Chemical Engineering, with lecturers also from the Faculties of Civil, Mechanical and Electrical Engineering and the Faculty of Architecture as well as those from other universities and non-university specialists, too. The program was started in September 1974 again and also proposed for February 1975, with a view to the vivid interest and to the great number of applicants.

Specialists having completed the "specialist engineer" degree program in environmental engineering are expected to have a deep overall kno wledge in international and national matters of environmental pollution and protection helping them recognizing and solving environmental problems, owing to the imparted correct environmental approach. However important the general, comprehensive environmental training is considered, also special training is given them to do and direct design, execution and supervision work in their specialities.

Curriculum of the "specialist-engineer" post-graduate degree program in environmental engineering

According to the two-year's curriculum of the Technical University Budapest, the program consists of 576 lectures. In the first year, all courses but one are the same for everybody. These are general primary courses in environmental engineering. Subsequently, the training is continued in four branches:

a) air quality management
b) water quality management
c) noise reduction
d) soil conservation and regional planning.

Great emphasis is laid on the biological aspects as the majority of engineers involved received little biological training in their undergraduate studies. For this reason, in the branches of air quality management, water quality management and soil conservation and regional planning the subject "Fundamentals of Biology" is included. The branch of noise reduction delivers "Fundamentals of Acoustics" from the second term on.

The curriculum of the "specialist engineer" degree program is shown in the table. In all branches, a special allocation of time was made for optional courses to be selected according to the student's interest.

These optional courses are the following:

Water Utilization, Biotechnology and Water Management, Selected Chapters in Water Supply and Drainage, Application of Nuclear Methods in Hydrology, Water Pollution Monitoring Instruments, Air Pollution Monitoring Instruments, Dust Pollution of Air, Meteorology of Air Pollution, Investigations and Measurements in Dust Technology, Industrial Noise Protection, Sound Damping in Buildings, Traffic Acoustics, Soil Microbiology, Plant Ecology, Geomorphology, Vibration Damping.

In the four-term "specialist engineer" degree program, the participants attend lectures and obtain an intensive practical training. This is completed by study trips. Each term is concluded by examinations and a mark is given on practical work. For being awarded the "specialist engineer" degree in environmental engineering a Final State Examination has to be passed in 3 courses, including Fundamentals of Environmental Engineering for all four branches and two other courses differing for each branch.

Those achieving excellent results are allowed to carry out environmental research and to prepare a thesis, based on which they can be granted the "Doctor Techn." degree.

Curriculum

	Hours per week in			
	1st	2nd	3rd	4th
	term			
	lecture + practical training			
Common courses				
Fundamentals of Environmental Engineering	4 + 0			
Conservation of Nature	2 + 0	0 + 1		
Siting and Construction of Industrial Plants	1 + 1			
Urban Planning and Reconstruction	2 + 0			
Computer Methods	1 + 1			
Harmful Effects of the Environment on Man		2 + 0		
Radioactive Pollutants and their Elimination		2 + 2		
Waste Treatment and Reutilization		2 + 0		
Special courses				
Branch of air quality management				
Fundamentals of Biology		3 + 0		
Distribution of Air Pollution			2 + 0	
Measurement of Air Pollution			2 + 3	
Industrial Air Pollution Control			2 + 1	3 + 2
Combustion Products of Fuels			2 + 0	2 + 0
Legal aspects of Air Pollution Control				2 + 1
Optional course				2 + 0
Branch of water quality management				
Fundamentals of Biology		3 + 0		
Chemistry and Technology of Water			1 + 1	
Microbiology of Water			1 + 1	
Water Quality Management and Control			2 + 0	
Water Analysis			2 + 3	
Waste Water Treatment			1 + 0	1 + 4
Disposal of Industrial and Agricultural Waste Waters				2 + 1
Optimization of Water Management Systems				1 + 0
Legal Aspects of Water Conservation				1 + 0
Optional course				2 + 0
Branch of noise reduction				
Fundamentals of Acoustics		2 + 1	2 + 2	
Subjective Acoustics			2 + 2	
Noise Emitting Sources				
Noise Damping			2 + 2	2 + 1
Acoustical Measurements				2 + 4
Infra- and Ultraacoustics				1 + 0
Optional course				2 + 0
Branch of soil conservation and regional planning				
Fundamentals of Biology		3 + 0		
Soil Science			2 + 0	
Regional Planning			4 + 2	
Soil Analysis			0 + 4	
Role of the Soil in Environmental Protection				2 + 0
Soil Conservation				4 + 0
Soil Conservation Planning				0 + 4
Optional course				2 + 0

Summary

The importance of developing a correct environmental approach is stressed; the training in environmental engineering at the Technical University Budapest is described, especially the post-graduate training. In undergraduate training of engineers, environmental engineering is taught mainly within the framework of different courses although the new curricula for some branches includes environmental engineering as a separate course. Post-graduate environmental engineering education is dealt with in detail and the curriculum of the "specialist engineer" degree program in environmental engineering is presented. The basic conception is that in addition to the common courses the engineers can specialize at will in either of four branches (air quality management, water quality management, noise reduction and soil conservation).

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