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Education of Automobile Engineers in Hungary

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It may be surprising for a number of readers that in such a small country as Hungary there exists training for engineers specializing in automobile technology. However, a closer look at the aims and contents of this seemingly restricted specialization indicates the purpose of such training. We feel that in our country machine design engineers (mechanical engineers) should be trained to construct almost any kind of machine. It is a matter of opinion where the engineer should acquire the knack for practical application: at the university or in practice? Our conviction is that a certain dexterity for practical application should be developed at the university, i.e. design engineers should be initiated into construction methods at the undergraduate level.

Construction and creation must be learned by using a problem in which the student becomes involved and which is solved by him completely in all details. Obviously, a number of machines could be selected on which the students could perform detailed design. For reasons of economy, however, at the University it is expedient to focus attention on a few types of machines only. This method of instruction saves time. It also saves money since only a few laboratories have to be established which can be equipped thoroughly in an uptodate manner.

The major consideration in selecting the type of problem is that is has to be instructional. We found that the automobile could be an example extremely fruitful from all viewpoints. The automobile is a combined, complex which constitutes an adequate subject for applying the principles of engineering physics and for practicing design. It is easy to demonstrate on the automobile not only the classic physical phenomena such as the mechanical, thermodynamic, etc. processes but also such relatively new subjects of instruction as automation, electronics, ergonomics, cybernetics, etc. In other words, anyone who has learned well how to design automobiles should, after acquiring certain complementary knowledge, be able to construct any kind of machine. It is for this reason that automotive engineers are trained at the Budapest Technical University. It should also be noted that there are other design oriented branches of mechanical engineering at the Technical University, such as manufacturing, textile technology, heat engines, fluid machinery, etc.

The training takes five years. In the tenth semester, however, only the diploma (thesis) work is performed. The curriculum as compared to that in the U.S. is very restricted; there are only a few electives. Students elect not courses but complete curricula. Each course in the curriculum is worth a certain number of "standard-hours", which are somewhat similar to the "credit-hours" used in the U.S. A standard hour represents at most one hour per week of (a) a lecture of recitation; (b) seminar or computation of problem; (c) laboratory; (d) drawing or design.

The actual contact hours may be less than the "standard hours" shown in the curriculum. A typical schedule is shown in Table I. The number of standard hours in each semester is uniformly 36 which some people feel is too high. An attempt is being made now to reduce the "standard hours" to 30 and the actual hours to 24-28.

Each digit in Table I has a place value. The first digit indicates the standard hours of the lecture, the second digit those of the seminars, the third digit shows the laboratory hours, while the fourth shows those of the drawing or design.

The "Introduction to Engineering" is scarcely more than the "physics" of the secondary school. For the first time, the young students must perform accurate calculations, get acquainted with dimensions and units of measurement, learn the handling of the sliderule, and get an insight into the elements of technical measurements.

The subjects of Chemistry, Mathematics, Mechanics are divided into two parts, in order to avoid the necessity of teaching certain sections of them too soon. This, on the one hand, lessens the jamming of the first years with previous basic subjects of instruction, while on the other, it renders possible the more logical building up of the various subjects during the five years of instruction. In mathematics for example we are lecturing those classic chapters in the first year which are needed for the engineering courses (engineering mechanics, thermodynamics, fluid mechanics, etc.). In the third year mainly uptodate mathematical methods are taught (mathematical statistics, linear programming, probability calculation, more special differential equations, mathematical logics, etc.) which will be applied by the students in the higher classes.

It is perhaps surprising that Physics is allotted a place at the end of the educational time. This is due to various reasons. On the one hand, at the secondary schools the instruction in physics is rather effective in this country. On the other hand, all its more important chapters are exhaustively dealt with in such fundamental courses as mechanics, thermodynamics, etc. The endeavor to make physics the foundation of the other courses has failed

CURRICULUM

for degree of "Mechanical Engineer"

in specialty "Automotive Engineering", branch "Automobiles".

Semesters	1	2	3	4	5	6	7	8	9	10
Gymnastics Foreign language Military knowledge Work safety	0020 0200 1100	0020 0200 -	0020 0200 1100	0020 0200 -	0200 - 2000	0200 -	0200 -	0200 -	- -	2000
Political Economics Philosophy Scientific Socialism	1100	1100	1100	-	- 2200	- - 2200	- - 0200	0200 -	0200	
Introduction to Engineering Chemistry Mathematics Descriptive Geometry Engineering Drawing	4210 4000 5500 1100 2005	0020 5500 1100 0002	0004							
Structure & Properties of Materials Engineering Mechanics		4020 6200	0020 4210	4210						
Manufacturing & Machining Processes Electrotechnique Machine Parts Design			4110 4010 4000	2010 4020 4014	4014	0004				
Thermodynamics				4210						
Fluid Mechanics Applied Mathematics					6210 4200	4200				
Automatic Control Applied Mechanics						4020 4220				
Computers Fluid & Thermal Machinery Light Constructions /Car Body/							2200 4220 4002		0020	
Machine Manufacture & Maintenance Engineering Chemistry Physics								4110 2020 2000	4020	
Industrial Management Industrial Economics									3200 5200	
Courses for the branch "Automobiles": Automobiles & Engines Automobile Design & Laboratory Engine Design & Laboratory Operation & Maintenance of Automobils					4020	4020	0004 6040	0026 6040	0046	
Diploma Work										=34=

Note: The place of figure marks the type of study:

0... Lectures, recitations
.0.. Seminars, problems, calculations
..0. Laboratory, gymnasium
...0 Design, drawing

The figures mark "standard hours" which represent the maximum of the factual hours per week.

almost everywhere, because the high level treatment of physics presupposes a rather high level mathematical background, which the student attains only during the third or fourth semesters.

Our physics consist of two parts. In the first one, the most important physical aspects of those subjects are summarized which have been taught in different courses during the first four years. In the second part topics are taught which at present are not yet integral parts of the technology but which may become such in the near future ("the physics of today represent the technology of tomorrow").

From among the four special courses, only "Automobiles and Engines" has a structure-expositive, descriptive character. After this students receive a synthesis in the courses "Engine Design and Laboratory", and Automobile Design and Laboratory". Here the students examine theoretically and experimentally the most characteristic physical processes going on in the automobile and, in addition, they solve design tasks. It is our constant endeavor to incorporate into these courses once more all the important physical laws already learned, together wich such concepts as correlations, measuring, testing and dimensioning processes. The relationship between these concepts is here emphasized and the relevance of these concepts of actual problems is shown.

The fourth special course "Operation and Maintenance of Automobiles" offers some insight into the life of the automobile after it leaves the factory. Problems dealt with here include motor highways, traffic, service, maintainance, and repairs.

The aim of diploma work (design or research) is for the students to solve an actual design or research problem. This work can be fulfilled in the design office or laboratory of either the department, certain research institutes, or even a factory.

The curriculum prescribes as many as three summer practices: after the first year the students take part in a six week automobile driver course and get a driver's license, after the third year they work for four weeks on machine tools in a training shop, and after the fourth year they spend four weeks in a factory.

Finally, a few words must be said about our University, The Technical University of Budapest. It has six faculties that are similar to the colleges or schools in the U.S. These faculties are: Architectural Engineering, Civil Engineering, Mechanical Engineering, Chemical Engineering, Electrical Engineering, and Transportation Engineering. Each of the faculties has at least 800 students, the largest being Electrical Engineering with 2500 students.

The name of the Faculty of Transportation Engineering is not quite appropriate. The faculty offers degrees in two fields: Transportation Engineering and Mechanical Engineering. Transportation Engineering represents one specialty with two branches: Railway Transportation and Road Transportation. In the field of Mechanical Engineering there is a choice between two specialties, one of them is the Automotive Engineering with two branches: Automobiles and Railway Vehicles. The difference in the curricula of these branches is only in the four special courses mentioned above.

The Faculty of Transportation Engineering has ten departments, among which are six service departments, such as Mechanics, Aero and Thermo-Techniques, Machine Elements and Parts, etc. The Department of Automobile Engineering is the course leader in the Automobile branch of the curricula, and provides service courses to the Road Transport branch.