EXPERIENCES WITH THE TEACHING OF CONTROL TECHNIQUES FOR ENGINEER STUDENT

Tihamér ÁDÁM, János CZEKKEL and István DALMI
University of Miskolc, Department of Automation
H-3515 Miskolc, Egyetemváros
autczekk@gold.uni-miskolc.hu

Abstract: The Department of Automation on the University of Miskolc is responsible for the training in Automation of all sorts of engineer student. Because of the different trainings, namely of the different diploma, the content of the subject varies according to the final goal. The college level (6 semester long study for mechanical and electrical engineering students) gives different kind of training again. The presentation gives a summery about the situation.

Key words: engineer education, control techniques, problems, consequences

Presentation

The University of Miskolc has a two-and-half century long history. In 1735 the Court Chamber of Vienna founded a school of mining and metallurgy in Selmecbánya (today Slovakia, Banská Štiavnica) in order to train specialist according to the requirements of the industrial revolution and to upgrade precious metal and copper mining of Hungary that was playing important role in the European relations in this time. In 1919 the college moved to Sopron (Hungarian west border) and after the World War II two faculties – mining and metallurgy – moved again. The new University in Miskolc was established in 1949 and completed with the Faculty of mechanical engineering. The training of lawyers started in 1981, of the economists in 1987, of the student of arts in 1992. There is higher education also in a Music School and a Teacher Training College in the structure of the University. The training period on the technical faculties is five years (MSc degree) but there is also a three years long study for BSc degree. Such an educations are construed for mechanical and for electrical engineers. It is remarkable that on the University of Miskolc is not a MSc training for electrical engineering.
The Department of Automation is responsible on the three engineering faculties for the training of the subject Automation (Control Technique). The duty is different, because this subject is an addition and gives a notion only about the application of this technique to the professional subjects. In this manner the Department generally has one semester log training and in this range in 30 hours lectures and in 30 hours laboratory practices.

Within the scope of these training the theoretical lectures contain the classical chapters of the open and closed loop control. The students get acquainted first with the element of the logical networks, programming by ladder diagrams, etc. and with the application of PLCs. The teaching material of the closed loop control study is description of transfer elements by different functions and the detailed investigation of the control loop (open loop gain, stability, compensation, etc.).

The examples of the subject varie according to given case, to the final goal, to the diploma. The Department of Automation accept the solution of the many-sided tasks, but there are some another Departments which take over the very specialized domains (e.g. control of tool machines or of mechanical production) from our Department.

The education of the electrical engineering students with 6 semester long learning gives bigger tasks for the Department. These people will be working in such industry where the deeper and more detailed knowledge of Control Technique is necessary. These students learn more theory and more practical application. The other earlier learnt subjects (theoretical electricity, digital techniques, mathematical modeling, etc.) help to the explanation and to the understanding of the theorems.

In the framework of the education of BSc electro engineer students it is possible to change among different specializations as follows:
- control technology of the production processes and communication technique
- informatics of the signals and of systems
- application of digital systems
- power electronics
- telecommunication
- electronic of the cars
- electro energetic

The professional subjects are about 50% of the total learning time, the special subject about 20% and the other subjects (economy, etc. and foreign language, physical training) are about 30% in the curriculum. Our Department is responsible for three domains Measuring Systems, for Digital Technique and for Control Engineering. These subjects represent the 11% of the total training.

The main subjects which are trained:
- Digital Systems I-II.
- Process Control I-II.
- Intelligent Control
- Industrial Communication Systems
- Telecommunication Systems
• GPS systems
• Programmable Logical Controllers
• Micro controllers and DSP-s
• Image Processing and Multimedia Systems
• Industrial Measurement Systems
• Car-automation and car-informatics

The laboratories for education are:
• Process Control Lab.
• Industrial Communication Systems Lab.
• Digital Systems Lab.
• SCADA and Process Visualisation Lab.
• Telecommunication Systems Lab.
• Process Simulation Lab.
• Measuring Systems Lab.

The practices in the laboratories are solved by different apparatus. The Department try to get complex and perfect equipments but the financial limits are unfortunately small. The different simulation methods are employed. Many thanks for the Department of Control System and Instrumentation (VSB, Ostrava) who placed the simulation program SIPRO at our disposal. The Department used in a long time the SIPRO with many successes. Now the MATLAB is applied because this is used on the University generally.

The selection of the content of the chapters adjusts to many considerations. There are on the one side the demands of students. This changes according to the temporary social standing. The students require a modern, up to day knowledge. Yesterday was even a big interest for more information technology, today for telecommunication, tomorrow – as we see – for the car automation and automation in the traffic system network. The Department is not prepared to satisfy all demand in all times. The staff tries to do the best on the part of itself, but the financial circumstances limit the keep pace with the expectations.

The Department is obliged invite the nobility of the production plant to help. They help with theirs big professional knowledge to the education and help with sponsoring with transmitting computers, hardware equipments, etc.

Each student must elaborate his/her diploma work in the last academic year. The theme changes according to the specialization. Because of the number of student about 60…70 persons, it is a big problem to find the best solutions. The consultation of the task and to find the suitable work place in the laboratories also is a difficult problem.

It was not mentioned till now that there are distance (in other words correspondence) courses in the education system too. The training is longer with one semester. The number of students is similar to the normal student, about 40…50 pro class.

We can state the students on the distance education are very diligent. They are in contact with the most modern technologies very often and they see exactly the contacts between theory and praxis better as the normal students. Their diploma work is in contact with one of the problem in their factory very often and the working out also is often very successful.
At last it is necessary to make mention about the problem with the specialized text books. The Hungarian language is not a current one and for this reason the technical book publication is not a big business. Therefore there is a significant lack of technical (text) books. Unfortunately the foreign language knowledge of the student is poor. Before the last (state) examination all student most obtain a minimum level in a foreign language on an independent official Institute outside of the University.

The latter difficulties are reduced by the application of the Internet network. We have the rich description of our lectures on the Homepage of the Department. This material is time to time renewed and the student can print it out. We have the experiences that this solution retrieves the lack of school boxes.

The Department tries to answer on these difficulties. The international exchange of experiences also help to make a successful and purposeful education.