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Aspects from the Museum of the Faculty of Engineering in Reșita

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Abstract. *The work presents elements of the professional activity carried out within the institution of higher technical education in Reșita, since its establishment (year 1971) and in the following 50 years of existence. The framework that was chosen is that of the establishment of a museum. Some significant devices and equipment worked with in the students' laboratory works, two stands made by students in the graduation projects, and two laboratory works made by students in some profile disciplines are presented.*

Keywords: *museum, faculty, engineering, laboratory, devices.*

1. Introduction

The engineering profession is an essentially applied one that is the theoretical knowledge and experience gained by each graduate during the years of study is expected to be materialized in a series of technical and execution projects, realization of stands and products, mainly industrial, concrete improvements of achievements of the type mentioned.

Reșița has a long industrial tradition, over 250 years (in 1771 the first metallurgical furnace was built) [1]. In the more than 50 years of operation of the higher technical education in Reșița [2], first as the Institute of Subengineering (ISR), part of the Polytechnic Institute Traian Vuia in Timișoara (IPTVT), in the field of engineering, many were trained at a high level generations of graduates.

The students carried out the applied activities in the institution's own laboratories, but also in two flagship Romanian factories, Uzina Constructoare de Mașini Reșita (UCMR) and Combinatul Siderurgic din Reșița (CSR), benefiting from the valuable experience of their specialists. UCMR and CSR are direct descendants of the famous interwar factory, Uzinele Domeniile Reșita (UDR) [3], a joint-stock company with Romanian, English, French and German shareholders. The UDR had direct origins from 1771 [1].

The name Faculty of Engineering (FI) appeared for the first time in 1991, initially as a component of IPTVT (today Politehnica University Timişoara-UPT-). Since 1992, it has been part of the recently established "Eftimie Murgu" University of Reşita (UEMR) [4], which, during its operation in this structure, continued to function, essentially, with similar specializations and derived from those existing at the time of its establishment higher education in Reşita: mechanical, electrical, metallurgical.

From the year 2020, UEMR merged, through absorption, with Babeş-Bolyai University from Cluj-Napoca [5]. Currently, the Faculty of Engineering in Reşita is part of the Reşita University Center of the Babeş-Bolyai University in Cluj-Napoca (CUUBB in Reşita) [6].

2. Organization of the museum

Considering the long industrial tradition in Reşita, of the functioning of a quality technical higher education in Reşita, I had the initiative to establish a museum of the Faculty of Engineering (internal address No. FI 493/20.10.2023). The UBB management, visionary and efficient, immediately approved funds, and the CUUBB and FI management ensured the progress of the works so that at the beginning of the summer of 2024, a first room of about 105 m was made available to the museum, in the E body. A sketch is presented in Figure 1.

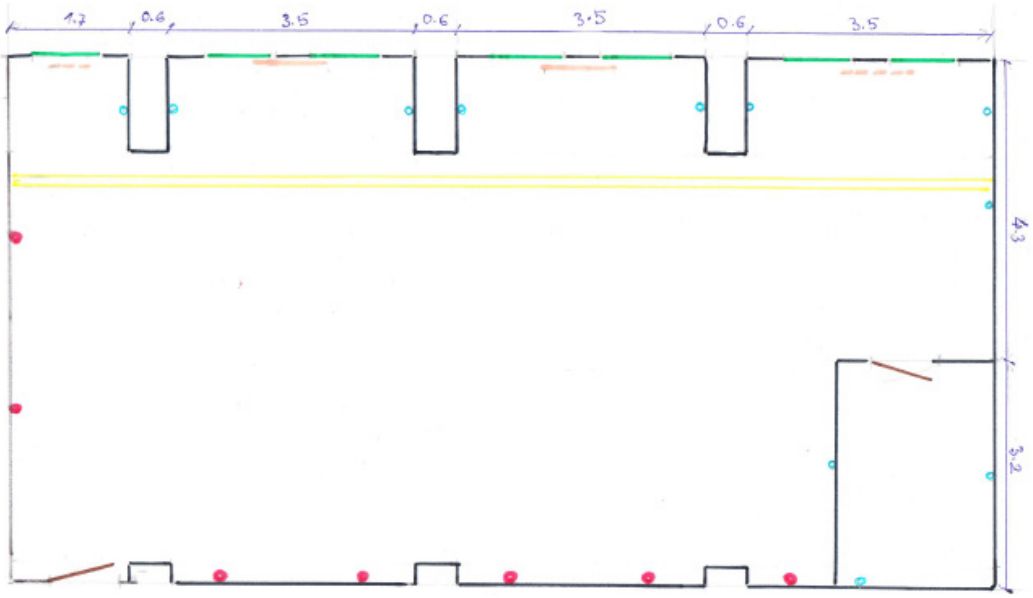


Figure 1. Exhibition hall sketch ● set of single-phase and three-phase sockets, single-phase socket, ▬ existing radiator, - - - installing radiator, ▬ window, ▬ pipes

Exhibits are presented in the museum, which, in one form or another, have been a component of the didactic activity carried out in the engineering field since its establishment (year 1971), in the following 50 years of existence (1971-2021). The exhibits are grouped by engineering fields that were studied at Reșita: mechanical, electrical, metallurgical, and by types:

- devices/installations/stands with which the activity was carried out in the laboratories;
- practical achievements (projects) of students/graduates during the didactic process.

It is desired that each exhibit be associated with some information, considered significant, as the case may be, such as name, year of manufacture, technical characteristics for devices/installations/stands, respectively name, author(s), year of completion for students' practical projects/graduates. This process has been initiated and is in progress for some of the pieces already on display.

Many of the devices, installations, industrial stands, and projects of students and graduates, following the checks carried out, were found to be at least partially functional and work is being done to improve their condition.

In the museum there are also pieces that could be considered auxiliary, such as 2 chalkboards - still used sometimes even today -, laboratory tables on which the equipment used to work was arranged, chairs on which the students sat in laboratory, a cupboard existing in laboratories since the foundation of the institution, (year 1971), for storing tools and laboratory equipment.

Considering that many of the devices, equipment, and stands used were produced in Romania, this fact is distinctly highlighted. As many know, Romania had - until the mid-1990s, at least - a consistent industry of its own, which contributed essentially to the development of the country and which was also able to provide products suitable for applied training in university engineering.

In Figure 2 and Figure 3 are presented images from which you can see the current organization of the museum, which, according to its expansion, will be adjusted, and in

Figure 2. Overview of the museum

Figure 3. Image from the entrance to the museum

Figure 4 part (shelf) of a cupboard from 1971 where devices/equipment were placed / auxiliaries used in laboratories. In the museum, we temporarily arranged some of the inventoried pieces. Currently, more than 100 pieces are exhibited, and several dozen more will follow.

Figure 4. Part (shelf) of a 1971 laboratory cabinet, now with some of the inventoried parts.

3. Exhibits

The paper then presents some exhibits considered representative of the activity carried out in the laboratories, with 3 exceptions (Figures 6, Figures 8, Figure 14), Romanian. Also, on display are (for now) two experimental stands used for laboratory work, reconstructed with the original equipment, as part of a Diploma Thesis [7].

The inventory numbers from that time are still visible in some of the exhibits.

Oscilloscopes are essential devices in any laboratory because practically, all mechanical, optical, thermal, chemical, etc. They can be converted with suitable transducers into electrical signals, and these can be visualized and measured with the oscilloscope.

Figures 5. The oscilloscope E-0101

The oscilloscope E-0101 [8] is the first oscilloscope for industrial use, Romanian - made in the 1970s - with the first electronic amplifier components in history (electronic tubes), used in laboratories for visualizing and measuring periodic electrical and electronic signals The oscilloscope [8] has a single channel of signal and allows the visualization of periodic electrical signals of direct and alternating current with frequencies up to f = 5 MHz and amplitudes from approx. 1mVvv to 250 Vvv.

Figures 6. HC3502 the analogue oscilloscope

HC 3502 is the first analog oscilloscope with two independent channels for synchronous measurement of two electrical signals up to 20 MHz frequencies - South Korea production-present in FI laboratories since the mid-1990s, which made it possible to carry out laboratory work and more complex research. Technical drawing was and remains one of the basic disciplines in the training of an engineer.

Figures 7. Drawing board

The drawing board was used for making all types of technical drawings, used before the advent of computers, in all institutions that had as their object of activity research and design in the engineering field.

Figure 8. Electromechanical graphics printer in two axes

An electromechanical graphics printer, in two axes, was used, before the advent of today's computers, for plotting on paper the graphics and characteristics of some components/equipment in XOY coordinates. It has been widely used in the study of systems of any type.

Figure 9. Handmade electric oven with resistors

The furnace was made as part of research-design activities in ISR and used for heating metallurgical samples at temperatures of the order of hundreds of degrees Celsius.

Figure 10. Electronic thermometer

This electronic thermometer is used to measure the temperature of mechanical, electrical, and metallurgical samples in the range 0...150 degrees Celsius.

Figures 11. E-4109 triple stabilized DC power supply with short circuit protection

The E-4109 source [9] provides three electrical voltages (5V/2A,+15V/0.4A, -15V/0.4A) stabilized, direct current, which is protected against short circuit. The voltage of 5 V/2A is a fixed one, being used in particular to power digital circuits made in TTL technology, but it can be used to power any analog or digital circuits that require this value. Each of the voltages of +15V/0.4 A, -15V/0.4A are actually variable, their values can be changed from 0V by the user by means of a multi-turn type fine-tuning potentiometer. The two sources can also be connected in series, thus obtaining a variable voltage between 0 and 30 V. The two sources can also work in differential mode, a useful situation especially in the case of powering circuits containing differential amplifier type components.

Figure 12. MAVO 35 analog laboratory multimeter

MAVO 35 analog laboratory multimeter produced since the 1970s, at IAEM Timișoara, was used for low-error measurements of direct and alternating voltages and currents, as well as electrical resistors. Direct and alternating current voltages can be measured in the range 1mV–1000 V, direct and alternating currents can be measured in the range 25uA–5A, and electric resistors in the range 0.2 Ω –50 MΩ. It enjoyed great success in foreign markets as well, today a clone is still manufactured in China, also exhibited in the museum.

Figures 13. Digital laboratory multimeter,

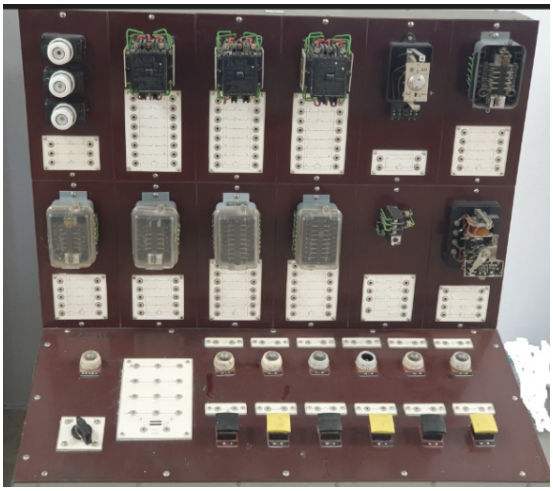
Laboratory digital multimeter presented is a stationary device produced at IEMI Bucharest, which was used in the ISR laboratories in the 1980s, and then, later, also in FI.

Figures 14. Portable digital multimeters

The presented multimeters are part of the first batch, from the beginning of the 1990s, with which the engineering faculty laboratories were equipped, used to measure voltages, currents, resistors and as the case may be, other parameters of electrical and electronic components.

In the higher engineering education in Reşita, it was a tradition that most graduation papers were completed with a practical achievement. The components of the graduation works came largely, until the mid-1990s, from donations of the two large factories in Resita. In many cases, these works were even carried out at the students' practice places in the two factories. Later, private companies sponsored the realization of the practical works. Several such practical works by students/graduates are exhibited in the museum, and in the present work two of them.

Figures 15. Inverter with transistors. The practical implementation of a Diploma Thesis from 1983

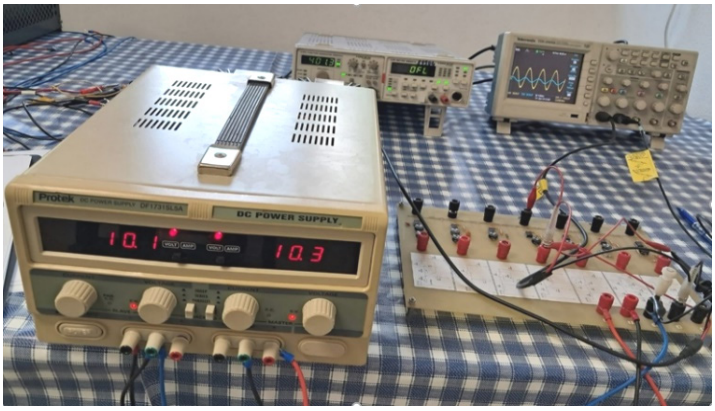


Figures 16. Stand for the study of electromagnetic relays Practical realization of a Diploma Thesis from around the 1990s

In the work [7], two of the laboratory works carried out by students, in relevant disciplines, were reconstructed and described, being now functional: 1. Measurement of voltage and currents in electric current circuits, carried out since the 1970s 2. Stand for determination of active filter parameters, carried out since the 1990s. Both are exhibited in the museum.

a b

Figures 17. Experimental part of the laboratory work Measurement of voltage and currents in electric current circuits **a.** the direct current circuit **b.** the alternating current circuit



Figures 18. Experimental circuit of the laboratory work Study of active filters with operational amplifiers

In the Figures 17, Figures 18 can be noted, being additionally inserted for an easier follow-up of the tests, in addition to the original components (test circuits, analog measuring devices, rheostat) and devices currently used in laboratories in framework of these works: Fluke 177 multimeter, Tektronics TDS2004 oscilloscope.

4. Conclusions and perspectives

Starting from the thoughts of the illustrious Nicolae Iorga: "A people who do not know their history is like a child who does not know their parents" and "Knowing history, heroes, tradition, we become more sociable, more altruistic, more loving to people and life", we considered that creating such a museum is a necessary, useful and responsible act.

Among the actions scheduled for the future, we mention:

- expanding the exhibition space, which is currently insufficient even for the existing pieces;
- increasing the number of exhibits with pieces from the mentioned period, which are still found in the laboratories;
- increasing the number of exhibits with pieces that have already been brought to the museum space, but which have not been exhibited for various reasons: inadequate condition, lack of space for exhibition;
- repair / reconditioning / putting back into operation some pieces that want to be exhibited;
- supplementing the exhibits with additional, basic information and exhibition of technical bibliographic materials for museum exhibits.

It is desired that, in the end, the Museum of the Faculty of Engineering can be visited by a wide category of public. At present, it is only at the beginning and there is still much to be done before reaching a state of it that is considered to be satisfactory to enter such a circuit.

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