

## Looking the Engineering Education in İTU: A hundred-years apart

Hande Vural\*, Burak Barutçu, Aytekin Çökelez

İstanbul Technical University

**Abstract:** Almost a century ago engineering became a non-military branch in Turkey with the establishment of the Engineering School/Mühendis Mekteb-i Âlisi and Mehmed Refik Fenmen was the first headmaster. Mehmed Refik endeavoured to teach technical issues to the public as a science communicator and he tried to bring a new education style. He wrote some new lecture books for physics classes and found an experimental museum to support the lectures. There are many details he has done in his time with following his footprints in the institutional records of İTU. Also, these revolutionary acts in those times' education make present-day people surprised. The purpose of this study is to compare the engineering education in İTU in the times of Mehmed Refik, 1910-12, and recent times. There is various education running in 29 engineering departments, hence Mehmed Refik was an electrical engineer, this study focused on electrical and electronics engineering education to show more precise results. This study shows how engineering education a century apart changed. What have we benefited from in the history of engineering education and what we may change today?

*Keywords; history of engineering education, history of higher education, Mehmed Refik Fenmen, Istanbul Technical University.*

*\*Correspondence to: H. Vural, Department of History of Science and Technology, İstanbul Technical University, Turkey. E-mail: hande.vural@itu.edu.tr*

### 1. INTRODUCTION

In the Ottoman Empire engineering education institutions were established under the military administrations to strengthen the military force. It can be said that Engineering Education Institutions became non-military in Ottoman Empire almost a century ago with the establishment of the Engineering School/Mühendis Mekteb-i Âlisi. In this study engineering education will be investigated a century apart changed in İstanbul Technical University (İTU) through archival recordings. The study focused on the newly established school in the date of 1910 with the first administration headmaster Mehmed Refik's<sup>1</sup> term to this day İTU. Since Mehmed Refik was an electrical engineer, this study focused on electrical and electronics engineering education to show more precise results. It is aimed to show how engineering education changed in a century within the scope of the study.

---

<sup>1</sup> After The Surname Law in 1934, Mehmed Refik took "Fenmen" as his surname.

Engineering education started with a military purpose in the Ottoman lands in the name of Humbaracı Ocağı/Corps of Bombardiers in 1735 by Comte de Boneval (1675-1747). In the 20<sup>th</sup> century, the institution needed to be passed to non-military administration with the extensive technological appliance needs and the advent of the Constitutional Monarchy. First, some innovations were made in 1884 with the establishment of Mülkiye Mühendis Mektebi or Hendese-i Mülkiye Mektebi/Civil Engineering School. It aimed to train non-military engineers, therefore the school was still in military order (Kaçar, 2007, p. 156). It has become possible to talk about this demilitarization with the Engineering School/Mühendis Mekteb-i Âlisi, which was completely subordinated to the Ministry of Public Works.

Engineering School/Mühendis Mekteb-i Âlisi was established on April 2<sup>nd</sup> of 1910. Mehmed Refik was both a science officer under the supervision of the Ministry of Public Works and an Electric Instructor at Hendese-i Mülkiye Mektebi/Civil Engineering School at that time. Regarding the consultation with the Ottoman Engineers and Architects Society, which was a member of the important engineers and architects in the Ottoman Empire, the Ministry's voting concluded with a majority vote for Mehmed Refik.

### *1.1 Engineering School/Mühendis Mekteb-i Âlisi: Looking the term of Mehmed Refik*

Mehmed Refik had two politically important grandfathers; Mithad Pasha, who was the grand vizier of the Ottoman Empire twice is his grandfather by his mother (Çetinsaya and Buzpınar, 2020), and Ahmed Rasim Pasha, who was appointed to many governorships, including the governorship of Bab-ı Ali (İstanbul) for a while, is also his grandfather by his father (Mehmed Süreyya, 1996, p. 1351). He was born in Preveza in 1882. He completed his primary education at Numune-i Terakki School and his secondary and high school education at Saint Benoit French High School (Akbaş, 2002; Student Registry Book, 1881). He completed his undergraduate education at the Mathematics-Physics Department of the Université de Lausanne (University of Lausanne) in Switzerland. Subsequently, he received a one-year specialization training at the University of Liège L'Institut Électrotechnique Montéfiore (Montéfiore Electrotechnical Institute) in Belgium and became an electrical engineer ("Those Who Left Us Forever: Our esteemed colleague Refik Fenmen" 1951, p. 73; Fenmen, 2006, p. 51; Meltem Akbaş, 2008).

After his graduation, he worked voluntarily for eight months in Thessaloniki Electric Company in 1906 (Meltem Akbaş, 2008, p. 103). On 1908, 14 November, he started to teach electricity lectures at Hendese-i Mülkiye Mektebi/Civil Engineering School, and on 25 November, he started to teach mathematics at the Mekteb-i Sultani (Galatasaray High School) (Kaçar et al., 2013, p. 243). On January 11, 1909, a new one was added to his responsibilities and he was appointed as Science Advisor in the Ministry of Trade and Public Works<sup>2</sup>. The name of Hendese-i Mülkiye Mektebi/Civil Engineering School was changed to the Mühendis Mekteb-i Alisi/High Engineering School and the administration of the school is demilitarized. Mehmed Refik was assigned to be the first headmaster of the Mühendis Mekteb-i Alisi/High Engineering School on April 02, 1910<sup>3</sup>. Due to the re-establishment of the school, Mehmed Refik planned to establish a building, laboratory and classroom furniture, library, and science museum.

<sup>2</sup> T.C. Başkanlığı Cumhurbaşkanlığı Devlet Arşivi, İ.TNF. 19/20, 16 Zilhicce 1926 (09 Januray 1909)

<sup>3</sup> İ.T. U. Instutional Archive, MÜM. 1/3, 20 Mart 1326 (02 April 1910)

When Mehmed Refik became the director of the Mühendis Mekteb-i Âlisi/Engineering School, it was aimed to re-establish the school. In the summer of 1910, he went on a forty-day expedition. In this trip, Drest and Berlin Engineering School in Germany, Gand Engineering School in Belgium, public and private Ecole Pontes et Chaussées in Paris, and Zurich Polytechnic in Switzerland are some of the schools examined (Kartekin and Uluçay, 1958, p. 213). Advice is obtained by meeting with the professors working in the aforementioned schools, and becoming a member of the publications of some schools. Additionally, Mehmed Refik collected information for the Science Museum project that he is planning to build in the school. Afterwards, Mehmed Refik prepared a series of articles called Engineering Schools in the Ottoman Society of Engineers and Architects Journal based on the knowledge he gained during this trip and his advanced research on the engineering school all around the world (Günerngun, 1987; Mehmed Refik, 1910). Furthermore, during the European tour, important professors in the schools here were consulted about the staff to be employed at the Mühendis Mekteb-i Âlisi/Engineering School. Belgian Monsieur May and Monsieur Dikman were invited during this period and a two-year contract was signed with them<sup>4</sup>.

Mehmed Refik suggested that studies should be done on modern materials to carry out the education by seeing and experiencing. Therefore, the museum is established and the regulations of the museum are requested by contacting Polytechnisk Arbeit in Switzerland<sup>5</sup>. The Science Museum is designed to provide tools for the lessons so that students can get to know the tools, understand their working principles, and learn through practice. The necessary equipment was taken to the classrooms and used, and the controls of the instruments were carried out by the museum officer. Permission has been sought from the Ministry of Trade and Public Works for the non-tender purchase of all necessary models for the science museum<sup>6</sup>. A model machine was requested from M. J. Conpenher (Paris) for the museum alongside their orders<sup>7</sup> Furthermore, some machines and models were bought from M. Papault and Rovelle (Paris)<sup>8</sup>, F. Krantz<sup>9</sup>, M. Peter Koch<sup>10</sup>, M. Delugrassé (Paris)<sup>11</sup>, and Politechischer Arbeits Institut<sup>12</sup> for the science museum. Additionally, samples were sent to the Science Museum by companies like Pirelli<sup>13</sup>. In the ITU Institution archive, the Science Museum establishment is mentioned with the names Mühendis Mekteb-i Âlisi/Engineering School<sup>14</sup>, Turuk-u Maabir Mektebi Müzesi/Ecole Pontes at Chaussées Museum<sup>15</sup>, and School Museum<sup>16</sup>. When the documents are examined, there is no information about the museum after 1917 except the models and machines divided among the faculties.

<sup>4</sup> T.C. Başkanlığı Cumhurbaşkanlığı Devlet Arşivi, HR.SYS. 2135/6, 05 January 1918

T.C. Başkanlığı Cumhurbaşkanlığı Devlet Arşivi, HR.SYS. 2138/1, 01 May 1918

<sup>5</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 6/90, 15 Haziran 1327 (28 June 1911)

<sup>6</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/55, 11 Temmuz 1327 (24 July 1911)

<sup>7</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 6/58, 30 Mayıs 1327 (12 June 1911)

<sup>8</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 8/57, 22 Ağustos 1327 (04 September 1911)

<sup>9</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 8/60, 22 Ağustos 1327 (04 September 1911)

<sup>10</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 10/82, 14 Teşrinisani 1327 (27 November 1911)

<sup>11</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 12/107, 02 Teşrinisani 1328 (15 November 1912)

<sup>12</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 11/74, 30 Kanun-u sani 1327 (12 February 1911)

<sup>13</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/5, 16 Haziran 1327 (29 June 1911)

<sup>14</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/5, 16 Haziran 1327 (29 June 1911)

<sup>15</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/55, 11 Temmuz 1327 (24 July 1911)

<sup>16</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/9, 19 Haziran 1327 (02 July 1911)

Mühendis Mekteb-i Âlisi/Engineering School Library is planned as a technical library for engineering books. While moving to its new building, it was moved from the library under the old administration with a small amount of non-military books and grew by adding it on top of this library. He had French engineering and mathematics books brought (Kartekin and Uluçay, 1958, p. 214). Technical publications and books were ordered from M. Beranger (Paris)<sup>17</sup>, Herr Leddihn<sup>18</sup>, Paris Dölo Vipanya Library<sup>19</sup>, and especially Dunod and Pinat (Paris)<sup>20</sup>. In addition, an agreement was made with the Ecole Spéciale des Travaux Public (School of Public Works) and their publications were ordered for the library<sup>21</sup>. Today, there are more than a thousand books in French published between 1880-1915 in the Rare Collection of İTU Mustafa İnan Library.

Students were required to do internships during the holidays by the school. Internships have been arranged by the school administration in important construction and industrial establishments (Oralalp, 1996, p. 74). While some of these internships took place in the construction of important irrigation canals, bridges and railways in the country, some of them took place in technical construction works abroad<sup>22</sup>. During the internship activities, students were provided with a per diem and a discount was provided for those who would travel in or abroad the country<sup>23</sup>. In addition to the internships, the students were taken on technical trips and had the opportunity to examine the factory and construction sites<sup>24</sup>. Students were asked to prepare reports about the aforementioned internship and technical trips.

### *1.2 Yüksek Mühendis Mektebi/High Engineering School*

Numerous revolutions and renewal movements took place with the proclamation of the Republic. With swift renewals and technological developments after the First World War, engineers were needed more than ever. Since it is the first and most well-established institution in Turkey to educate engineers, the eyes were turned to the Mühendis Mekteb-i Âlisi/Engineering School. The first work done was to restructure the school as the “Yüksek Mühendis Mektebi/High Engineering School” on May 24, 1928, with a new regulation.

As a country that had just emerged from the First World War and had a newly established Republican regime, Turkey was experiencing budget problems in the 1920s. It is planned to reduce the budget by combining the common courses and departments taught at the Yüksek Mühendis Mektebi/High Engineering School and Darülfünun. During the studies, the Department of Electrical Engineering, which was established at Istanbul University in 1925, taking the program of the “Electromechanic” Institute of Nancy University as an example, was connected and moved to Yüksek Mühendis Mektebi/High Engineering School. Students who were in the last year of the Electrical and Mechanical Engineering Department of Darülfünun completed their education at the Yüksek Mühendis Mektebi/High Engineering School. However, it was not considered appropriate to combine two deep-rooted institutions with two different cultures only for budgetary

---

<sup>17</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 5/22, 13 Mart 1327 (26 March 1911)

<sup>18</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 8/9, 03 Ağustos 1327 (16 August 1911)

<sup>19</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 9/54, 25 Eylül 1327 (07 October 1911)

<sup>20</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 1/15, 07 Eylül 1326 (20 September 1910)

<sup>21</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 2/22, 02 Teşrinisani 1326 (15 November 1910)

<sup>22</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 1/44, 20 Haziran 1326 (03 July 1910)

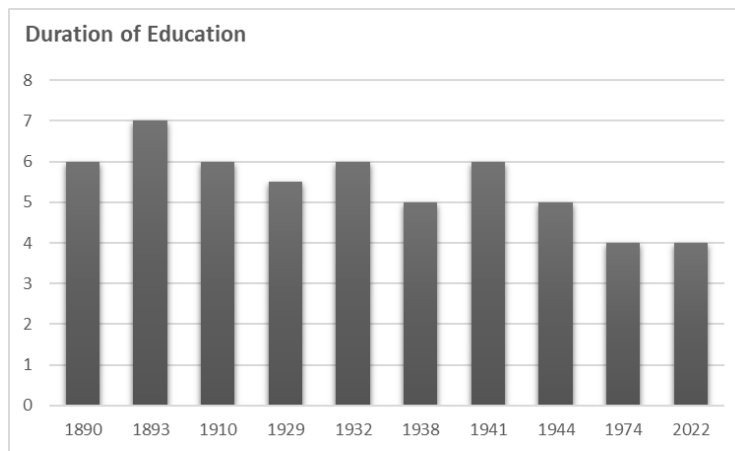
İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/41, 01 Temmuz 1327 (14 July 1911)

<sup>23</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 6/65, 04 Haziran 1327 (17 June 1911)

<sup>24</sup> İ.T. Ü. Kurum Arşivi (İ.T. U. Institutional Archive), MÜM. 7/7, 19 Haziran 1327 (02 July 1911)

reasons. Even though the students graduated from the Yüksek Mühendis Mektebi/High Engineering School, the unification of the faculties did not take place.

As it can be seen in Figure 1 below, from the times of Hendese-i Mülkiye Mektebi/Civil Engineering School] to current times in İTÜ the duration of education is changed frequently. When the school first regulated the duration become five years and then it changed up to seven years. With Mehmed Refik's term, the duration was fixed to six years and in the Yüksek Mühendis Mektebi/High Engineering School the duration changed to five to six years. After the University term begins in Turkey, the education duration is five years. In 1974 İTÜ changed the duration of education to four years (Kaçar et al., 2013, p. 294). In 1936, there were seven laboratories including Physics, Chemistry, Hydraulics, Electro-Technical Applique, Electrical Survey, Material, Telephone, and Telegraph Survey laboratories (Kartekin and Uluçay, 1958, p. 292).



**Figure 1** This graphic shows the education duration over the years.

### 1.3 The University Journey of Turkey and the İTÜ

In 1943, with the meeting held by the Minister of Education Hasan Ali Yücel, it was decided to establish an institution equivalent to the Polytechnic, like other nations (Kartekin and Uluçay, 1958, p. 460). With the help and cooperation of Rector Tefik Taylan and the preparation of the University was finished. On 12 July 1944 İstanbul Technical University was established with the 4619 numbered code officially. Table 1 can be seen below, through a hundred-year the number of faculties increased in İTÜ as technology and science developed. In addition, the number of branches shows us that modern engineers are more advanced in their fields.

Yüksek Mühendis Mektebi/High Engineering School transformed into the İstanbul Technical University on 12 July 1944. Fuat Külünk became the first dean of the Electricity Faculty, and education of the Electricity Faculty in this period was divided into High Current and Weak Current Departments but the official opening of the divisions is June 15, 1946. The High Current Division consisted of five departments; Electrotechnique and Electrical Measurement, Electrical Machines, Electrical Installation, High Voltage Technique, High Voltage Transmission Lines, and Industrial Applications of Electricity laboratory. While the Low Current Division consisted of three departments; Electrical Engineering, Electronics and. Communication Engineering, and Control and Computer Engineering (Erdoğan et al., 1994, pp. 17–18).



Date Number	1910	1928	1944	1994	2022
1		Road and Railway E.	Civil E.	Civil E.	Civil E.
2		Architecture and Civil E.	Architecture	Architecture	Architecture
3		Hydraulic E.	Mechanical E.	Mechanical E.	Mechanical E.
4		*Mechanical-Aircraft	Electrical-Electronics E.	Electrical-Electronics E.	Electrical and Electronics E.
5		*P.T.T.		Naval Architecture and Ocean E.	Naval Architecture and Ocean E.
6				Maritime	Maritime
7				Mines	Mines
8				Chemical-Metallurgical E.	Chemical-Metallurgical E.
9				Aeronautics and Astronautics E	Aeronautics and Astronautics E
10				Management	Management
11				Science and Letters	Science and Letters
12					Computer and Informatics E.
13					Textile Technologies and Design

**Table 1 İTU Faculties according to years.**

**\* Mechanical-Aircraft and P.T.T. (Post and Telegraph Organization Faculties) graduate only in 1943 (Kartekin and Uluçay, 1958, p. 698).**

In March 2020 Covid-19 Pandemic quarantines began in Turkey. This situation leads the İTU rectorate to online education. The arrangements with Zoom meeting company and its integration into the İTU Ninova System make it easier to follow the lectures. Electrical and Electronics Faculty and all other faculties continue to the lectures online. The theoretical classes continue online and their content is just as it has been done before the Covid-19 Pandemic period. Laboratories and application classes are held differently in the electric and electronics departments. In the electronics department, online simulations are used in online laboratory lectures. In the electrics department especially in power electrics laboratories' lessons assistants carried out the experiments in live sessions. However, as the pandemic restrictions began to ease, the theoretical classes turn to hibrite and all the laboratory classes were given face-to-face. (*Personal Communication with Electrical- Electronics Faculty Member Prof. Dr. Müştak E. Yalçın, 2022*).

İTU engineering students are required to do an official internship for 45 days within 3 years, and during this internship, they must prepare an internship book and report. The internship institution is required to prepare a report on the student's practical work. Students prepare a Senior Design Project- Capstone Design Project in their final year. Students whose projects have certain competencies are subjected to an oral exam open to the participant, and those whose projects are accepted by the decision of the commission are entitled to graduate.

İTU has more than 530 laboratories and 35 research centres. Those laboratories and research centres provide an opportunity for the students to conduct their experiments and research. There

are 22 laboratories within the Faculty of Electrical and Electronics; ten laboratories are actively used in the İTU Electrical Engineering department and also, twelve laboratories in the İTU Electronics and Communication department; (İTUEE, 2022; İTUECE, 2022). These laboratories are used actively in the research and classes.

## 2. RESULTS

As a result of the history of engineering education through a hundred years of engineering education at İTU, the main difference is the emergence of sub-branches of engineering. In Mühendis Mekteb-i Âlisi/Engineering School, each engineering student had the smallest technical details on how to set up and operate the factory. Thus, the students visited many factories and construction fields to learn more details about real-life engineering. In the first years of İTU, students have similarly visited the Silahdarağa factory, the Driver's School, and the Science Faculty laboratory of the Darülfünun as part of the lectures. However, in time with specialization of areas, the work is mostly done in the laboratories since we have industrial engineers.

Throughout a hundred years technology and science continuously developed. Manhood went to the Moon and now we all are looking to the screens that have not existed in this manner back that time. We educate our engineers in the technology era by looking back at our history. Next year İTU will celebrate its 250<sup>th</sup> year and we can say that we still need to learn countless things from the engineers from Mühendis Mekteb-i Âlisi/Engineering School and its first headmaster Mehmed Refik.

## 3. ACKNOWLEDGMENT

I would like to express my deep thanks to Prof. Dr. Müştak E. YALÇIN for his support in guidance of current engineering education in the İTU process at the Faculty of Electrical and Electronics Engineering.

## 4. REFERENCES

Akbaş, M., 2002. Einstein'ın Görelilik Kuramının Türkiye'ye Girişi (Introduction of Einstein's Theory of Relativity to Turkey) (Master Thesis). İstanbul Üniversitesi, İstanbul.

Akbaş, M., 2008. Elektrik Mühendisi Mehmet Refik Fenmen: Osmanlı'dan Cumhuriyet'e Yenilikçi ve Yorulmaz Bir Aydın (Electrical Engineer Mehmet Refik Fenmen: An Innovative and Determined Intellectual from the Ottoman Empire to the Republic). *Osmanlı Bilimi Araştırmaları*, 9 (1), 101–118.

Aramızdan Ebediyen Ayrılanlar: Kıymetli meslekdaşımız Refik Fenmen (Those Who Left Us Forever: Our esteemed colleague Refik Fenmen), 1951. *TYMB*, 68, 72–76.

Çetinsaya, G., Buzpınar, Ş.T., 2020. Midhat Paşa (1822-1884). In: TDV İslâm Ansiklopedisi.30, 7-11.

İTUEE, 2022. Laboratories of Electrical Engineering Department,

Url: <https://elk.itu.edu.tr/en/home>

İTUECE, 2022. Laboratories of Electronics and Communication Engineering,

Url: <https://ehb.itu.edu.tr/en/research/laboratories>

İTU History, 2022. İTÜ Tarihçesi (İTU History). Url: <http://www.disiliskiler.itu.edu.tr/itu-hakkinda/itu-tarihcesi>

Erdoğan, E., Gören, L., Erimez, E., Büyükaksoy, A., 1994. *Elektrik- Elektronik Fakültesinin Altmış Yılı (Sixty Years of the Faculty of Electrical and Electronics)*. İstanbul: Bileşim Yayıncılık.

Fenmen, N., 2006. Refik Fenmen: Mühendisliği ve Eğitimciliği ile Örnek Bir Fen Adamı (Refik Fenmen: An Exemplary Scientist with His Engineering and Education). In: Mühendislik Mimarlık Öyküleri II (Stories of Engineering and Architecture II). Ankara: TMMOB, 49-60.

Günergun, F., 1987. Osmanlı Mühendis ve Mimarları Arasında İlk Cemiyetleşme Teşebbüsleri (The First Communion Attempts among Ottoman Engineers and Architects), In: Osmanlı İلمي ve Mesleki Cemiyetleri. Presented at the 1. Milli Türk Bilim Tarihi Sepozyumu. İstanbul: Edebiyat Fakültesi Basımevi, 155-196.

Kaçar, M., 2007. Tersâne Hendesehânesi'nden Bahriye Mektebi'ne Mühendishâne-i Bahrî-i Hümâyûn. *Osmanlı Bilimi Araştırmaları*, 9 (1), 51–77.

Kaçar, M., Zorlu, T., Barutçu, B., Bir, A., Ceyhan, C.O., and Neftçi, A., 2013. *İstanbul Teknik Üniversitesi ve Mühendislik Tarihimiz (İstanbul Technical University and Our Engineering History)*. İstanbul: İstanbul Teknik Üniversitesi Vakfı.

Kartekin, E. and Uluçay, Ç., 1958. Yüksek Mühendis ve Yüksek Mimar Yetiştiren Müesseselerin Tarihi (History of High Engineering and High Architecture Schools). İstanbul: İstanbul Teknik Üniversitesi Vakfı.

Mehmed Refik, 1910. Mühendis Mektepleri I (Engineering Schools I). *Osmanlı Mühendis ve Mimarlar Cemiyeti Mecmuası*, 4, 76–79.

Mehmed Süreyya, 1996. Sicill-i Osmanî 4, S. A. Kahraman trans., N. Akbayar eds. İstanbul: Tarih Vakfı Yurt Yayınları.

Personal Communication with Electrical- Electronics Faculty Member Prof. Dr. Müştak E. Yalçın, 2022.

Student Registry Book, 1881. Benoit French High School Archive.