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Araştırma Makalesi

An Analysis of Architectural Technology Education in Turkey

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ABSTRACT

Architectural education is a generous field for researches; however, the studies about Architecture Technology education are very limited. Especially when the architecture schools in Turkey are considered, it is safe to say that the number of different approaches about the Architectural Technology education is parallel with the increasing number of different architectural education programs in universities. To clarify this tangled picture, this study intends to make a research regarding different approaches about Architectural Technology education in Turkey and to put forward the current types and trends. In order to demonstrate different approaches in Architectural Technology education, thirty architecture schools have been chosen and analyzed to reflect the main picture. The selection has been carried out according to the OSYM 's list of undergraduate programs. The research material has been obtained from the schools' education programs declared in their web sites as "Academic Package" and the analysis has been made by the quantitative factors. As a result of these analysis process, it is possible to evaluate and compare the sub-fields of the Architectural Technology education (Building Materials, Building Construction, Building Physics, Structures etc.) according to the ECTS values, number of the courses, weekly course hours, and semesters.

Keywords: *Architectural Technology Education, Construction Technology Education, Architectural Education*

Türkiye'deki Mimari Teknoloji Eğitimine Yönelik Bir Analiz

Öz

Mimarlık eğitimi, bilimsel araştırmalar için oldukça zengin bir alan olmasına rağmen Mimarlık Teknolojisi eğitimi ile ilgili çalışmalara çok rastlanılamamaktadır. Özellikle Türkiye'deki mimarlık okulları göz önüne alındığında, Mimarlık Teknolojisi eğitimi ile ilgili farklı yaklaşımların sayısının, üniversitelerde artan sayıda farklı mimari eğitim programlarına paralel olduğunu söylemek yanlış olmaz. Bu karmaşayı netleştirmek amacıyla yapılan bu çalışma ile Türkiye'de Mimarlık Teknolojisi eğitimi ile ilgili farklı yaklaşımlar hakkında bir araştırma yapmak ve mevcut türleri ve eğilimleri ortaya koymak hedeflenmiştir. Mimari Teknoloji eğitimindeki farklı yaklaşımları göstermek için otuz mimarlık fakültesi seçilmiş ve genel yönelimleri yansıtmak üzere analiz edilmiştir. Üniversitelerin seçimleri ÖSYM'nin "Merkezi Yerleştirme İle Öğrenci Alan Yükseköğretim Lisans Programları" listesindeki taban puan sıralamasına göre yapılmıştır. Araştırma verileri, okulların resmi web sitelerindeki "Akademik Paket" sekmelerinde ilan edilen eğitim programlarından elde edilmiş ve niceliksel bir analiz yapılmıştır. Bu analiz sürecinin sonucunda Mimari Teknoloji eğitimini oluşturan alt-alanların (Yapı Malzemeleri, Mimarlıkta Yapı ve Yapım Teknolojileri, Yapı Fiziği, Taşıyıcı Sistemler vb.) AKTS değerleri, ders sayıları, haftalık ders saatleri ve yer aldıkları eğitim-öğretim dönemlerine yönelik olarak bir değerlendirme ve karşılaştırma yapmak mümkün olmuştur.

Anahtar Kelimeler: *Mimari Teknoloji Eğitimi, Yapı Teknolojisi Eğitimi, Mimarlık Eğitimi*

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1. INTRODUCTION

Architecture is a profession described as a “multidisciplinary” field (D’Souza, 2007) related to many areas such as technology, culture and history. This multidisciplinary aspect inevitably leads to the union of different fields in education (Boge & Sullivan, 2004). Although architecture education, where different fields of expertise are brought together, is directed towards common goal (architecture diploma), the differences in the paths taken leads to diversity (Wright, 2004).

In spite of diversity can be considered a wealth of approaches, it can also lead to lack of control and complication. When it comes to architecture, which is one of the most important and influential professions of the past, present and future; a systematic approach to the development of educational approaches in this field is of great importance. The first step towards systematic approach to architectural education is the analysis and evaluation of existing educational approaches that have been accumulated over the years as a heap (Ghonim & Eweda, 2018). However, when the architecture education literature is examined, while there are quite a number of scientific publications aimed at the field of “Architectural Design", a lack of studies aimed at “Architectural Technology" field, which is the scope of this article and is one of the most important areas of architecture education and accommodates various areas of specialization such as Building Technology, Architectural Materials, Structural Systems, Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration and Land Surveying (Emmitt, 2002) is seen. The reason for this trend is that while the architectural design field is considered as the "nucleus”, “backbone”, "focal point” of architectural education, all other fields of specialization are defined as “supporting" or "complementary" (Emmitt, 2002) (Oakley & Smith, 2007) (Ozmehmet & Alakavuk, 2016).

In order to take a step towards eliminating this gap, this study aims to analyze the different approaches to the "Architectural Technology" field from within the different areas of architecture education (Table 1) in Turkey. Accordingly, the study aims to define the place and gravity of the different approaches to architectural technology education in the entirety of architectural curricula in Turkey. Thus, a portrait of the education given to the Architectural Technology field in the architecture schools in Turkey has been attempted.

The questions to be answered in this study are as follows:

- What is the place and gravity of the Architectural Technology field within the educational curriculum of the architecture schools in Turkey?
- Is it possible to talk about different approaches to the Architectural Technology field? If possible, what are these approaches and how can they be grouped?

In order to demonstrate different approaches in Architectural Technology education, thirty architecture schools have been chosen and analyzed to reflect the main picture. The selection has been carried out according to the OSYM ’s list of undergraduate programs. The research material has been obtained from the schools’ education programs declared in their web sites as “Academic Package” and the analysis has been made by the quantitative factors. As a result, it has become possible to evaluate and compare the sub-fields of the Architectural Technology education (Building Materials, Building Construction, Building Physics, Structures etc.) according to the ECTS values, number of the courses, weekly course hours, semesters and course types (theoretical/studio/lab).

Table 1: Classification of divisions of architectural schools' curriculums (URL-2, URL-3).

Main Field Group	Main Fields
Design/Creative Thinking	Architectural Design Studio Drawing and presentation techniques in architecture Informatics in architecture
History / Theory, Culture / Art	History of Architecture Architecture Theory Art and culture in architecture Conservation, Renovation & Restoration in Architecture
Environment /City / Society	Urban Design / Urbanism & Zoning Law Landscape Design Interior Design
Technology	Architectural Technology
Occupational environment	Project Management in architecture
Graduation	Graduation Study / Thesis Graduation Project
Electives	In-field selective Non-field selective
Out-of-school experience	Internship / Vocational Practice Foreign education
Non-architecture	Basic sciences: • Turkish • Revolution History • Foreign language • Computer

2. METHODOLOGY

While defining the methodology of this study for the analysis of Architectural Technology Education in Turkey, it is possible to divide the work carried out into two main groups, "Sample Selection Method" and "Analysis Method".

2.1 *Sample Selection Method*

For the selection of the thirty architectural undergraduate programs, a list based on the base score values listed in the 2016 SSPC guideline was used (URL-1). The list consists of ninety-three architectural undergraduate programs, the ranking of these schools are based on the base scores of the 2015 LYS results. While programs belonging to the public universities are represented by a single line in this ranking, the lowest SSCP score of entry to the architecture department that year is considered for private universities as they offer various enrollment options such as 100%, 75%, 50%, 25% scholarships and full tuition. If a school has both English and Turkish architecture programs, these programs are evaluated separately in the rankings, but only one of them is taken into consideration as their curricula are translated.

As highlighted earlier, there is an obligation to make a choice within the ninety-three architectural programs in the ranking. In this study which aims to display Turkey in the context of the Architectural Technology field, the basis of the refractions between the base scores have been identified, and the selection of thirty undergraduate programs has been made at as equal intervals as possible to represent each refraction (Table 2). However, whether or not the data on the official websites of the schools is adequate is also considered as an important criterion for the selection.

Table 2. The List of Selected Universities Regarding Their Base Scores of 2016's OSYM List (URL-1)

#	Status	Location	School Name
1	Public	ISTANBUL	ISTANBUL TECHNICAL UNIVERSITY
2	Public	ANKARA	MIDDLE EAST TECHNICAL UNIVERSITY
3	Public	ISTANBUL	YILDIZ TECHNICAL UNIVERSITY
4	Public	ISTANBUL	ARCHITECT SİNAN FINE ARTS UNIVERSITY
5	Public	ANKARA	GAZI UNIVERSITY
6	Public	IZMIR	IZMIR INSTITUTE OF TECHNOLOGY
7	Public	IZMIR	DOKUZ EYLUL UNIVERSITY
8	Public	ESKISEHIR	ANADOLU UNIVERSITY
9	Public	BURSA	ULUDAĞ UNIVERSITY
10	Public	KONYA	SELÇUK UNIVERSITY
11	Found.	ANKARA	İHSAN DOĞRAMACI BİLKENT UNIVERSITY
12	Public	TRABZON	KARADENIZ TECHNICAL UNIVERSITY
13	Public	MERSIN	MERSIN UNIVERSITY
14	Public	DENIZLI	PAMUKKALE UNIVERSITY
15	Public	ISPARTA	SÜLEYMAN DEMİREL UNIVERSITY
16	Public	EDIRNE	TRAKYA UNIVERSITY
17	Public	SIVAS	CUMHURİYET UNIVERSITY
18	Public	MARDIN	MARDİN ARTUKLU UNIVERSITY
19	Public	NIGDE	ÖMER HALİSDEMİR (NİGDE) UNIVERSITY
20	Public	KIRKLARELI	KIRKLARELİ UNIVERSITY
21	Found.	ANKARA	TED UNIVERSITY
22	Found.	ISTANBUL	BAHÇEŞEHİR UNIVERSITY
23	Found.	ISTANBUL	YEDITEPE UNIVERSITY
24	Found.	ISTANBUL	İSTANBUL BİLGİ UNIVERSITY
25	Found.	ISTANBUL	BEYKENT UNIVERSITY
26	Found.	ISTANBUL	ÖZYEĞİN UNIVERSITY
27	Found.	ISTANBUL	OKAN UNIVERSITY
28	Found.	ISTANBUL	ISTANBUL KULTUR UNIVERSITY
29	Found.	TRABZON	AVRASYA UNIVERSITY
30	Found.	ISTANBUL	MALTEPE UNIVERSITY

The data used in the analysis was obtained largely from the "Academic Package" pages, which were published under the Bologna process on the official websites of the schools. Although the "Academic Package" pages contain very detailed data, it has been noted that some schools do not keep these pages up to date and complete at all times. In such cases, we have attempted to obtain the missing information by contacting with the academicians responsible for the related courses.

The raw data obtained have been processed according to a system developed within the scope of this study and has been divided into groups titled "Course Code, Course Name, Year / Level, Semester, Local Credits, ECTS, Total Course Hours". Following the grouping stage, the schools have been subject to a three-stage, percental analysis based on "ECTS Ratio, Number of Courses Ratio, Course Hours Ratio", and as a result of these analyses, it was possible to reveal the type and trends of the education given in the architecture undergraduate programs in Turkey with a focus on "Architectural Technology".

2.2 *Analysis Method*

In order to perform the analyses of the thirty schools that have been selected in the "Architectural Technology" field, a necessity of grouping the courses in this field in each curriculum has emerged. This grouping is referred to as "Classification and Sub-

Classification", and the classification title represents the basic fields in the curriculum and sub-classification represents the sub-specialization areas within these basic fields.

In determining the basic fields and sub-fields, two types of sources, including “YÖK’s (Council of Higher Education) Science Fields Keywords and MIAK (Architectural Accrediting Board) Accreditation Requirements - Knowledge, Skills and Competencies Required from Graduates” have been utilized, and additions have been made by the researcher in the cases where it was deemed necessary. As a result, it has been possible to divide the main Architectural Technology field into sub-fields such as Building Technology, Architectural Materials, Structural Systems, Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration and Land Surveying (Table 3).

Table 3. Classification of divisions of architectural schools’ curriculums (URL-2, URL-3)

YÖK’s (Council of Higher Education) Science Fields Keywords	**MIAK (Architectural Accrediting Board)**	**Additions have been made by the researcher**
Acoustic and Noise Control Physical Environmental Control Materials and Technology in Architecture Building and Construction Technologies / Systems in Architecture	Architecture - Technology	Architectural Technology Structural Systems Building Physics & Sanitation Architectural Technology Integration Land Surveying
Final Classification		
<u>Architectural Technology:</u> Building Technology Architectural Materials Structural Systems Building Physics & Physical Environmental Control & Sanitation Architectural Technology Integration Land Surveying		

Following the determination of analysis criteria and classification criteria, the courses included in the main field of the Architectural Technology that comprise the scope of this study have been identified and the analysis tables summarizing the data for all these courses have been created. In addition to the course code and course name information year, period, local credit (where available), ECTS value and course hours’ data divided into three groups namely theoretical, applied and laboratory are also included in the analysis tables.

Following this determination and compilation process, analysis and grouping studies of the courses within the scope of the Architectural Technology field have been carried out of which a sample is seen in the Table 4. While these courses have been divided into subclasses according to the different areas of specialization within the Architectural Technology class, analysis studies were also carried out for the training methods used in these courses. Categorizations, names of the courses, contents and weekly course hours were taken into consideration and examined. The "class" category in the table represents the field of Architectural Technology. The “Sub-Class" category includes various areas such as "Building Technology, Architectural Materials, Structural Systems, Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration and Land Surveying”.

Table 4. An Example of Making Common Format in the Analysis Process (URL-4)

Analysis of Architectural Technology Courses in Istanbul Technical University

Sub-classification	Course Code & Name	Year	Sem.	Local Credits	ECTS	Total Course Hours
Str. Systems	MIM 125E Statics	1	1	1,5	3,5	2
Str. Systems	MIM 126E Strenght of Materials	1	2	1,5	3,5	2
Str. Systems	MIM 253E Steel Structures	2	3	1,5	2,5	2
Str. Systems	MIM 271E Theory of Structures	2	3	1,5	2	2
Str. Systems	MIM 234E Reinforced Concrete Structures	2	4	3	3	4
Arch. Tech. Integration	MIM 484E Construction Project	4	7	5	12	8
Build.Tech.	MIM 203E Building and Const in Arch.	2	3	3,5	5	4
Build.Tech.	MIM 125E Arch. Build. Element Design	2	4	4	6	5
Build. Physics & Physical Env. Control & Sanitation	MIM 126E Env. Control Studio	2	4	5	6	8
Architectural Materials	MIM 253E Building Materials	2	3	3	6	4

Thereafter the determination and analysis studies, the data of the classified courses were calculated by categorizing them according their groups and the proportion of the “Vocational Courses" in their respective curriculum. These calculations are based on ECTS, Number of Courses and Weekly Course Hours as seen on the table below (Table 5).

Table 5. An Example of Determining the Percentage Values in the Analysis Process

ECTS, Numbers of Courses and Total Course Hours Analysis of Architectural Technology Courses in Istanbul Technical University

Architectural Technology	ECTS	No. of Courses	∑ Course Hrs.	% ECTS	% No. of Courses	% ∑ Course Hrs.
Land Surveying	0	0	0	0%	0%	0%
Structural Systems	14,5	5	12	29%	29%	50%
Architectural Technology Integration	12	1	8	24%	20%	10%
Building Technology	11	2	9	22%	22%	20%
Building Physics & Physical Env. Cont. & Sanitation	6	1	8	12%	20%	10%
Architectural Materials	6	1	4	12%	10%	10%
Building Technology & Architectural Materials	0	0	0	0%	0%	0%
Building Technology & Land Surveying	0	0	0	0%	0%	0%
total	**49,5**	**10,0**	**41,0**	**100%**	**100%**	**100%**

In addition to the below-mentioned analysis study, the distribution of sub-fields in the eight-term architecture curriculum can be seen in the Table 6. Again, when the following table for the Istanbul Technical University is examined it can be seen that the courses aimed for the Building and Construction Technologies in Architecture specialization are placed in the second, third and fourth semesters within the eight-semester curriculum. In addition, it can be seen in the table that there are no courses for the Land Surveying specialization within the program.

Table 6. An Example of Determining the Distribution of Sub-Fields According to the Semesters in the Analysis Process (Istanbul Technical University)

Architectural Technology	**1st sem.**	**2nd sem.**	**3rd sem.**	**4th sem.**	**5th sem.**	**6th sem.**	**7th sem.**	**8th sem.**
Land Surveying								
Structural Systems	1	1	2	1				
Arch. Tech. Integration							1	
Building Technology			1	1				
Build. Phys.& P.E.C. & S.				1				
Architectural Materials			1					
Build. Tech. & Arch.Mat.								
Build. Tech. & Land Surv.								

3. RESULTS OF THE ANALYSIS

In this section, the results of the thirty schools, which were converted into a common format and analyzed as described above, have been summarized as a common table. The values obtained were proportioned to the values of the entire vocational courses in the curricula of the schools then the period analyses and percentage rates of the ECTS, number of courses, weekly course hours have been presented.

The data have been collected between 2016 and 2018. The reason for selecting a range such as this is that the data of the study have been first collected in 2016 and when an update was attempted in 2018, this decision could be applied for 28 schools while 1 school was known to undergo changes not reflected on its official website, and changes in another school weren't possible due to technical problems on its website.

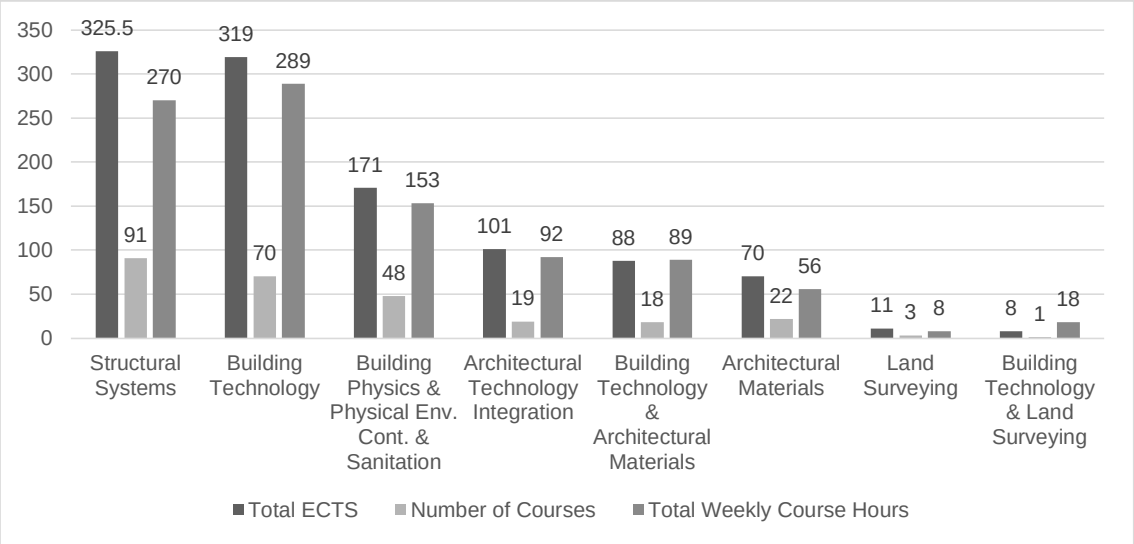
3.1 *Step One – Sorting the sub-field data for each school and calculating % values (separately for each sub-field)*

The data for the selected thirty schools have been individually filtered according to the sub-fields "Land Surveying, Structural Systems, Architectural Technology Integration, Building Technology, Building Physics & Physical Environmental Control & Sanitation, Architectural Materials" and the percentage values of each school's ECTS, number of courses and weekly course hours in the entire Architectural Technology field have been calculated as an example can be seen on Table 7.

Looking at the overall data for the Architectural Technology field of architecture schools in Turkey (Graph 1), the Structural Systems sub-field is seen to have the largest share of 325.5 ECTS, according to the criteria of total 1093.5 ECTS. While Structural Systems sub-field takes second place with a value of 319 ECTS followed by Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration, Architectural Materials and Land Surveying sub-fields. "Building Technology & Architectural Materials" and "Building Technology & Land Surveying" courses where the education for two separate sub-fields are given in conjunction place fifth and eighth place respectively.

Table 7. An Example of Making Common Format in the Analysis Process

Formatting the Data Belogs to the Building Technology Sub-Field For Analysis Process															
#	**School Name**	**ECTS**	**# of Crs.**	**∑ Cr. Hrs.**	**% ECTS**	**% # of Crs.**	**% ∑ Cr. Hrs.**	**#**	**School Name**	**ECTS**	**# of Crs.**	**∑ Cr. Hrs.**	**% ECTS**	**% # of Crs.**	**% ∑ Cr. Hrs.**
1	ISTANBUL TECH. UNI.	11,0	2,0	9,0	22%	22%	20%	**16**	TRAKYA UNI.	9,0	2,0	8,0	26%	30%	22%
2	MIDDLE EAST TECH. UNI.	8,0	2,0	10,0	15%	17%	18%	**17**	CUMHURİYET UNI.	15,0	3,0	12,0	48%	46%	38%
3	YILDIZ TECH. UNI.	12,0	2,0	12,0	25%	26%	17%	**18**	MARDİN ARTUKLU UNI.	15,0	4,0	15,0	44%	48%	44%
4	ARCH. SİN. FINE ARTS UNI.	12,0	3,0	15,0	31%	39%	27%	**19**	ÖMER HALİSD. (NİGDE) UNI.	12,0	2,0	6,0	33%	29%	25%
5	GAZI UNI.	18,0	4,0	25,0	34%	43%	25%	**20**	KIRKLARELİ UNI.	8,0	2,0	8,0	20%	24%	17%
6	IZMIR INST. OF TECH.	20,0	5,0	22,0	45%	48%	42%	**21**	TED UNI.	5,0	1,0	3,0	50%	50%	50%
7	DOKUZ EYLUL UNI.	25,0	5,0	20,0	42%	41%	36%	**22**	BAHÇEŞEHİR UNI.	0,0	0,0	0,0	0%	0%	0%
8	ANADOLU UNI.	14,0	3,0	12,0	42%	39%	33%	**23**	YEDITEPE UNI.	11,0	2,0	8,0	28%	32%	25%
9	ULUDAĞ UNI.	15,0	4,0	14,0	45%	52%	40%	**24**	İSTANBUL BİLGİ UNI.	0,0	0,0	0,0	0%	0%	0%
10	SELÇUK UNI.	23,0	3,0	17,0	53%	46%	30%	**25**	BEYKENT UNI.	10,0	2,0	6,0	25%	25%	25%
11	İ.D. BİLKENT UNI.	5,0	1,0	3,0	14%	13%	14%	**26**	ÖZYEĞİN UNI.	4,0	1,0	4,0	16%	20%	17%
12	KARADENIZ TECH. UNI.	13,0	4,0	12,0	33%	30%	36%	**27**	OKAN UNI.	4,0	1,0	4,0	13%	13%	13%
13	MERSIN UNI.	0,0	0,0	0,0	0%	0%	0%	**28**	ISTANBUL KULTUR UNI.	14,0	3,0	12,0	36%	36%	27%
14	PAMUKKALE UNI.	11,0	3,0	9,0	31%	25%	38%	**29**	AVRASYA UNI.	14,0	3,0	12,0	47%	43%	43%
15	SÜLEYMAN DEMİREL UNI.	11,0	3,0	10,0	33%	36%	33%	**30**	MALTEPE UNI.	0,0	0,0	0,0	0%	0%	0%



Graph 1. Total value chart for the ECTS values, Numbers of Courses and Weekly Course Hours of all of the sub-fields in Architectural Technology.

Based on the “number of courses”, the Structural System sub-field takes the first place in the with 91 courses out of a total of 272. This course is followed by “Building Technology, Building Physics & Physical Environmental Control & Sanitation, Architectural Materials, Architectural Technology Integration, Building Technology & Architectural Materials, Land Surveying and Building Technology & Land Surveying” sub-fields. In contrast to the other two criteria, Building Technology sub-field, which accounts for 289 out of 975 hours ranks first in the “weekly course hours” criterion, followed by Structural Systems, Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration, Building Technology & Architectural Materials, Architectural Materials, Building Technology & Land Surveying and Land Surveying sub-fields.

It can be seen that out of the thirty schools selected 27 do not offer Land Surveying, 14 do not offer Architectural Technology Integration, 4 do not offer Building Technology, 6 do not offer Building Physics & Physical Environmental Control & Sanitation and 10 not offer Architectural Materials courses. In the consolidated sub-fields, it is seen that while 10 schools incorporate the Building Technology & Architectural Materials consolidated sub-field, only four of these provide consolidated education, and six offer courses in Building Technology and consolidated Building Technology & Architectural Materials sub-field separately. Only one school provides education this way the consolidated sub-field of Building Technology & Land Surveying.

3.2 *Step Two – Analyzing the data comes from each school for each of the sub-field (summarizing all data for each sub-field)*

The first analysis of this study is the ratio analysis of the ECTS values of the courses in the field of Architectural Technology to all vocational courses within the curricula of the schools in Turkey. For this purpose, the total ECTS value of each course belonging to Land Surveying, Structural Systems, Architectural Technology Integration, Building Technology, Building Physics & Physical Environmental Control & Sanitation and Architectural Materials sub-fields have been proportioned separately to all of the vocational courses within their respective programs and then these values were grouped to develop a profile for Turkey and summarized in a single table. 10-unit percentile intervals have been generated on the common table. However, %0 and

%100 values have been subtracted from these intervals. Thus, it has been possible to determine the number of schools that did not offer the analyzed sub-fields in their curriculum.

The table, which reveals the "Distribution of Architectural Technology Courses Regarding to their total ECTS Values" of the selected 30 schools, reveals that the Architectural Technology field consists mainly of Structural Systems, Architectural Technology Integration, Building Technology, Building Physics & Physical Environmental Control & Sanitation and Architectural Materials sub-fields. As can be seen from Table 8, none of the percentage distribution of the ECTS values of sub-fields belonging to the Architectural Technology field could exceed the 50% threshold; however, Building Technology sub-field comes close with a value of 40-49%.

While all schools that have been examined in this study offer courses for the Structural Systems sub-field the rate of ECTS values for this sub-field is in the range of 20 to 29% in 10 schools and 30-39% in 10 schools. The courses belonging to the Architectural Technology Integration sub-field are included in the curricula of 16 out of the 30 schools, and the courses for this field are generally grouped in the range of 10 to 19% in terms of their ECTS values. The ECTS values of the courses for the Building Technology sub-field, that were encountered in 26 schools, were equally grouped in 7 schools at 30-39% and at 40-49% another 7 schools. When the ECTS values of the courses for the Building Physics & Physical Environmental Control & Sanitation sub-field seen in 24 out 30 schools are grouped, majority have been found to be in the range of 20 to 29%. Finally, 11 of the 20 schools that included the Architectural Materials sub-field in their curricula appeared to be in the 1-9% ECTS rate group (Table 8). Structural Systems with a value of 30-39% was revealed to be the highest valued sub-field for the number of courses analysis in the Architectural Technology field when the "Distribution of Architectural Technology Courses Regarding to Their Number of Courses" were examined for these 30 schools. While followed by the Building Technology sub-field with a value of 20-29%, Architectural Technology Integration, Building Physics & Physical Environmental Control & Sanitation and Architectural Materials in the range of 10-19% came in third (Table 8).

When the table summarizing the "Distribution of Architectural Technology Courses Regarding to their Weekly Course Hours" of these schools is examined, the fact that values for the Building Technology sub-field are quite diverse stands out. The courses for this sub-field have been equally divided into 3 groups, 20-29%, 30-39% and 40-49%, and they appear to leave the other sub-fields in terms of course hours. The Structural Systems sub-field ranks second with a value of 20-29%, it is followed by Architectural Technology Integration and Building Physics & Physical Environmental Control & Sanitation with a value of 10 to 19%. The Architectural Materials sub-field comes in last place with a value of 1 to 9%, and it has emerged as the sub-field with the least amount of weekly course hours within the Architectural Technology field (Table 8).

During the evaluation of the table showing the distribution of the courses within the 8-semester education plan, the arithmetic averages of the course numbers of the courses belonging to these sub-fields in the curricula of the 30 schools were evaluated first. It is seen that the Structural System sub-field, consisting of 3 courses, is generally placed in 3rd, 4th and 5th semesters. When Building Technology and Building Physics & Physical Environmental Control & Sanitation sub-fields with an average of 2 lessons are examined and the courses belonging to the Building Technology sub-field are mostly included in 3rd and 4rd semesters, courses belonging to Building Physics & Physical Environmental

Table 8. Distribution of Architectural Technology Courses Regarding to their total ECTS Values, Number of Courses and Weekly Course Hours

% ECTS												
Architectural Technology	**0%**	**1-9%**	**10-19%**	**20-29%**	**30-39%**	**40-49%**	**50-59%**	**60-69%**	**70-79%**	**80-89%**	**90-99%**	**100%**
Land Surveying	27	1	2	0	0	0	0	0	0	0	0	0
Structural Systems	0	0	5	10	10	4	1	0	0	0	0	0
Arch. Tech. Integration	14	1	10	5	0	0	0	0	0	0	0	0
Building Technology	4	0	4	6	7	7	2	0	0	0	0	0
Build. Phys.& P.E.C. & S.	6	2	10	11	1	0	0	0	0	0	0	0
Architectural Materials	10	11	9	0	0	0	0	0	0	0	0	0
Build. Tech. & Arch.Mat.	20	0	3	2	1	3	1	0	0	0	0	0
Build. Tech. & Land Surv.	29	0	1	0	0	0	0	0	0	0	0	0
% Numbers of Courses												
Land Surveying	27	2	1	0	0	0	0	0	0	0	0	0
Structural Systems	0	0	1	8	15	3	3	0	0	0	0	0
Arch. Tech. Integration	14	3	12	1	0	0	0	0	0	0	0	0
Building Technology	4	0	6	8	7	4	1	0	0	0	0	0
Build. Phys.& P.E.C. & S.	6	0	11	9	4	0	0	0	0	0	0	0
Architectural Materials	10	7	13	0	0	0	0	0	0	0	0	0
Build. Tech. & Arch.Mat.	20	0	4	3	2	1	0	0	0	0	0	0
Build. Tech. & Land Surv.	0	1	0	0	0	0	0	0	0	0	0	0
% Weekly Course Hours												
Land Surveying	27	2	1	0	0	0	0	0	0	0	0	0
Structural Systems	0	0	7	10	9	3	1	0	0	0	0	0
Arch. Tech. Integration	14	1	9	6	0	0	0	0	0	0	0	0
Building Technology	4	0	3	7	7	7	2	0	0	0	0	0
Build. Phys.& P.E.C. & S.	6	1	12	9	1	1	0	0	0	0	0	0
Architectural Materials	10	14	6	0	0	0	0	0	0	0	0	0
Build. Tech. & Arch.Mat.	20	0	3	2	1	3	1	0	0	0	0	0
Build. Tech. & Land Surv.	0	0	0	0	1	0	0	0	0	0	0	0

Control & Sanitation sub-fields are in the 5th and 6th semesters. Architectural Materials and Architectural Technology Integration sub-field, which has an average course number of 1 are taught during the 3rd and 7th semesters in architecture education (Table 9).

Table 9. Distribution of Architectural Technology Courses Regarding to the Semesters

Architectural Technology	**1st sem.**	**2nd sem.**	**3rd sem.**	**4th sem.**	**5th sem.**	**6th sem.**	**7th sem.**	**8th sem.**
Land Surveying	0	1	1	1	0	0	0	0
Structural Systems	3	7	**24**	**24**	**21**	9	3	0
Arch. Tech. Integration	0	0	1	4	5	3	**6**	1
Building Technology	4	14	**21**	**16**	10	4	0	1
Build. Phys.& P.E.C. & S.	0	0	2	12	**16**	**15**	3	0
Architectural Materials	2	7	**12**	1	0	0	0	0
Build. Tech. & Arch.Mat.	0	5	8	5	0	0	0	0
Build. Tech. & Land Surv.	0	0	1	0	0	0	0	0

4. CONCLUSION & DISCUSSION

Within the scope of this study, which aims to reveal the different approaches to the Architectural Technology sub-field, which is an important part of architectural education in Turkey, 30 architecture schools have been examined and their curricula have been analyzed from this perspective.

This study shows that while some of the courses included in undergraduate architecture curricula in Turkey are losing their validity in present conditions, others become indispensable in today's conditions. For instance, although courses in the Structural Systems sub-field are included in every school's curricula, Land Surveying sub-field has lost its place within the architecture undergraduate curriculum.

The fact that the curricula of a considerable amount of schools do not include an Architectural Technology Integration, which consolidates all information belonging to Architectural Technology, is awfully shocking and worrying. Even though it has been proposed to carry out this integration process in an Architectural Design Studio, the feasibility of this idea is thought to be questionable.

In addition to all of these observations, it was seen that Building Technology and Building Materials courses are suited to be taught both individually and combined, and that the schools inclined to incorporate these two courses.

Consequently, In the light of the resulting data, it is seen that education in the Architectural Technology field generally cover Structural Systems, Architectural Technology Integration, Building Technology, Building Physics & Physical Environmental Control & Sanitation and Architectural Materials sub-fields. When all these sub-fields have been analyzed according to their quantitative values in curriculums they belong to, it has been encountered with a diversity.

When these sub-fields are contextualized according to their ECTS values, number of courses, weekly course hours and proportioned to the other vocational courses in their curriculum, it is seen that the Building Technology sub-field accounts for the largest ECTS and course hours' ratio. The courses for the Structural Systems sub-fields' ECTS values and weekly course hours were found to be fewer compared to the Building Technology sub-field.

From Building Physics & Physical Environmental Control & Sanitation, Architectural Technology Integration and Architectural Materials sub-fields, which have the same number of courses and follow the two above-mentioned sub-fields, Building Physics & Physical Environmental Control & Sanitation sub-field has a higher ECTS ratio, Architectural Materials on the other hand, has the least ECTS and weekly course hours.

In the analysis of these sub-fields according to their school year, education for the field of Architectural Technology is seemed to start in the second year of architecture education. It has been determined that Architectural Technology education starts with courses for Structural Systems, Building Technology and Architectural Materials sub-fields continues with Building Physics & Physical Environmental Control & Sanitation in following years and completed with Architectural Technology Integration in the final year of architecture education.

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[1] This paper is the preliminary study for the article, namely “An Analysis of the Content of Building Technology Education in Turkey Regarding to Bloom’s Taxonomy” (unpublished), and same internet sources have been used for the analysis.