An Assessment on Awareness Level of Graduating Students Regarding the Significance of Sustainability

Mahrokh Pooyanmehr

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Approval of the Institute of Graduate Studies and Research

Prof. Dr. Serhan Çiftçioğlu
Acting Director

I certify that this thesis satisfies the requirements as a thesis for the degree of Master of Science in Interior Architecture.

Prof. Dr. Ulaş Uğur Dağlı
Chair, Department of Interior Architecture

We certify that we have read this thesis and that in our opinion it is fully adequate in scope and quality as a thesis for the degree of Master of Science in Interior Architecture.

Asst. Prof. Dr. Münevver Özgür Özersay
Supervisor

ExaminingCommittee

1. Assoc. Prof. Dr. Maya Öztürk
2. Assoc. Prof. Dr. Umut Türker
3. Asst. Prof. Dr. Münevver Özgür Özersay

ABSTRACT

The built environment is one of the most important sectors, which influences the progress towards sustainability. Lately, important improvements in understanding sustainability have been made. However, there is a crucial problem in making this information accessible to key people and also in motivating the different actors to collaborate. Meanwhile, even though it is not very easy to teach an awareness on sustainability and collaboration, this study enhances a belief that higher education institutions do and can play a significant role.

Based on these ideas, this quantitative research, investigates the awareness level of the graduating students of the five professions, which are involved in the design of the built environment (Architecture, Civil Engineering, Electrical Engineering, Interior Architecture, and Mechanical Engineering) and are offered as undergraduate educational programs at the Eastern Mediterranean University (EMU).

A comprehensive survey was designed and distributed to the graduating students of these five departments at EMU. The findings show that most of the students have passion for sustainability regardless of their department. However, from the level of awareness towards sustainability, the results indicate that there is still a lot improvement chances.

Keywords: Sustainability, Built Environment, Interdisciplinary Collaboration, Higher Education.

ÖZ

Yapılı çevre, sürdürülebilirliğe ilişkin ilerlemeleri etkileyen en önemli sektörlerden biridir. Son zamanlarda, bu sektörde birçok ilerleme kaydedilmiştir ancak, bunlarla ilgili bilgilerin kilit kişilere ulaşamaması/erişememesi ve bu aktörlerin birbirleri ile işbirliği halinde ilerlememeleri önemli bir problem teşkil etmektedir. Sürdürlebilirlik ile ilgili farkındalık ve işbirliği eğitimi ne kadar zor olursa olsun, yüksek öğrenim kurumları bu bağlamda çok önemli bir sorumluluğa ve role sahiptir.

Bu nicel araştırma, Doğu Akdeniz Üniversitesi çatısı altında, yapılı sektörün tasarım ve uygulamalarında etkin rol alan beş ayrı mesleğin (Mimarlık, İnşaat Mühendisliği, Elektrik Mühendisliği, İç Mimarlık ve Makine Mühendisliği) lisans eğitim programlarından mezun adayı olan öğrencilerin, sürdürülebilirlik farkındalığını ele alır.

Beş bölümden mezuniyet seviyesinde olan öğrencilere yönelik kapsamlı bir anket hazırlanmış ve dağıtılımıştır. Sonuçlar, çoğu öğrencinin, hangi bölümden olduğuna bakmazsızın sürdürülebilirlik konusuna ilgili olduğuna işaret ederken, farkındalık seviyesine yönelik, halen kat edilecek uzun bir yolun olduğuna yönelik ipuçları vermektedir.

Anahtar Kelimeler: Sürdürülebilirlik, Yapılı Çevre, İnterdisipliner İşbirliği, Yüksek Öğrenim.

To four holy beings

The one who strengthened me with his vigor

One who got white haired to have me glorious

My ever advocates and patrons of my life

And my premier, who lightened my path with her countless unconditional supports and efforts

My Father

My mother

My sisters

And my lovely supervisor

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1

INTRODUCTION

1.1 Background to the Problem

'Sustainable' and 'sustainability' is becoming an increasingly important part of contemporary everyday life. Sustainability is broadly defined as the capacity of the renewal of a product or resource without having any or many far reaching environmental impacts without jeopardizing the potential for people in the future to meet their needs. The basic principle of sustainability is; everything we require for survival depends directly or indirectly on our environment. The challenge for a sustainable environment is to create our surroundings with a sustainable design. The design and construction of the built environment has a big influence on this process of making sustainable environments. Sustainability maintains and creates the conditions that enable humans and nature to co-exist in harmony, this in turn creates a more structured and less wasteful economy, utilizing all resources in an efficient way, sustainability meets social and other needs for the coming generations. The sustainable built environment is concerned with creating spaces using design principles such as accessibility, functionality and aesthetics which extend the focus to include environmental considerations in three parts:

- The efficient use of space.
- Choosing building materials that have the lowest environmental impact.
- Energy consumption, pollution, and waste reduction.

Sustainability is one of the most important elements of interior architecture because we live in a world where building resources are finite and known energy supplies are dwindling rapidly. It can be said not one single Interior Architecture, Civil , Electrical and Mechanical Engineering professional can solve the vast challenges we face regarding sustainability, but collectively, between various disciplines and professions mentioned above we can approach the challenges sustainability pose and find tangible solutions to the far reaching impacts that sustainability has on each of our lives. At the Eastern Mediterranean University (which will be abbreviated as EMU from here on), the above mentioned disciplines of Architecture, Civil , Electrical, Interior Architecture and Mechanical Engineering are being taught in their respective departments. The objective of this study is to ascertain the awareness level that the EMU graduating students have on the issue of sustainability and environmental sensitivities concerning the build environment.

1.2 The Study Context

The study is conducted at the EMU. The subject of this research are from the following five departments within the EMU; Architecture, Civil and Electrical Engineering, Interior Architecture and Mechanical Engineering. With a population of closely 19,000 students from 68 different countries EMU is the largest university in Turkish Republic of North Cyprus (which will be abbreviated as TRNC from here on). Within recent years the EMU has been at the forefront of social and economic development within the city of Famagusta, creating a social and economic hub of support for the surrounding town. Famagusta is the second largest city within the TRNC, and is located approximately 74 km from the south of Turkey. Presently an increasing number of foreign students are living in the city of Famagusta beside the local Turkish-Cypriots and the current population of Cyprus is estimated to be about 741.000. Out of this number, Famagusta has a population of overall 42,000 persons. Formerly the city was pivotal in trading and a tourism center within the district before the division of the Cyprus into Northern and Southern part (Oktay, 2011). Now, it is playing an essential role for TRNC not only as a port city; with very valuable eco-cultural heritage but also with EMU being a big part of it.

1.3 Problem Statement

The built environment is one of the most important sectors and ultimately it influences the progress towards a more sustainable world. As time goes on more and better advancements are made in the field of sustainability. However, there is a crucial problem in making this information accessible to the key people responsible for making complex decisions. Generally speaking, the discussions related to sustainable consumption are familiar to sectors related to the design of consumer goods, but they are less known in the construction sector. It is increasingly important to take into consideration the ways water, energy, materials and carbon etc. will be utilized for the long term sustainability of any design related to the built environment or construction project. At the same time, in order to achieve a more sustainable environment, there is a vital need for collaboration between different sectors; such as businesses and institutions, members of the design team, civil societies, consumers, educators etc. Even though it is not very easy to teach an awareness on sustainability and collaboration, this study enhances believe that higher education institutions do and can play a significant role.

1.4 Aims and Objectives

The main goal of the research is to measure the awareness of the future members of the built environment (namely architects, civil engineers, electrical engineers, interior designers and mechanical engineers) on environmental issues and sustainability. In other words, it investigates the awareness level of the graduating students of the above five mentioned disciplines of the built environment design team, which have educational undergraduate programs in the relevant departments at EMU.

It is hoped that the results of this study will inform the administration and the academics alike, who are involved in the daily teaching practices, as they are the individuals who teach students in classes and studios on a personal level it is hoped that by the increase of awareness on sustainability, the heads of department can have a direct knock effect at creating a culture of sustainability orientated mindsets within the students The results of this study are to inspire both academic heads and students alike, while encouraging everyone to become involved in the preparation of the course learning outcomes and to include a stronger measure of concern for sustainability related issues as a whole.

In addition, this research aims to find out whether there is a sense of a sustainability awareness among the graduating students within the above mentioned five departments relating to the need for an interdisciplinary or collaborative approach and hence help to emphasize the importance of coordination and cooperation among the various disciplines that are involved in the design of the built environment.

1.5 Research Questions

The research will go over two major issues through the following questions:

1. What is the awareness level of the graduating students about the concept of sustainability relating to the design of the built environment?
2. What are the student views on collaboration between various disciplines/professions who are involved?

1.6 Proposed Methodology

Within the scope of this study, in order to reach optimum results, the main methodology was proposed as a quantitative one. This was mainly because the research aim was very specific: to explain the phenomenon of "sustainability awareness" through collecting numerical data from a selected sample group and then analyzing this data by using a mathematical/statistical approach.

The main source of sample group selection are the graduating students of five different departments in EMU, which have a base education relevant to issues of sustainability that are important for the design of built environment. The main tools used for the collection of data were questionnaires which were gathered from graduating students of the above mentioned departments in order to gather data regarding their awareness levels of sustainability. These departments are: Architecture, Civil and Electrical Engineering, Interior Architecture and Mechanical Engineering. It was important to select the graduating students due to the likelihood that in their chosen fields there was a high probability that they have come across the issues of sustainability relative to their field.

Questionnaires were structured in a way to measure the level of awareness of students for the purpose of this research. A pilot study has been previously done in a smaller group, naming academic staff and researchers in the EMU. The collected data was organized and analyzed using ‘Microsoft Excel 2013’ and the results are illustrated in the thesis with tables related to each individual question followed by a summary and discussion of findings.

1.7 Outline of the Study

This study is presented in five different chapters. The first section is the introduction chapter which outlines the main data connected to the introduction and of the objectives of this study. Also within this introduction information about the possible contribution of the research and target methodology is presented. In the second chapter the explanation of different dimensions of sustainability, leadership in environmental design systems, and other environmental issues such as energy etc. are discussed. Chapter 3 contains more information about the methodology, sampling issues, collection of data, design of questions, and the analysis of the collected data. Chapter 4 covers the results and findings of this study, with a main focus on the level of awareness of students in environmental and sustainability issues and also contains a discussion of collected results of this study. Chapter 5 contains the recommendations for administrative and academics as well as practitioners with regard to steps that can be taken for the relevant academic heads in order to improve the cross-discipline principle of sustainability within academic circles.

1.8 Limitations of the Study

There are several limitations, which draw clear boundaries for the current study. The first one is related to the main theme concerned, and that is sustainability.

This study focuses mainly ,and only, on the sustainability within the built environment. It looks at the role the designers of the built environment can play for implementing measures related to sustainability. In other words, it does not make an investigation on any dimensions of sustainability as related to some other areas; such as economics, food industry, agriculture etc.

The second limitation of this study is related to the type of questionnaire. The questionnaire developed for this study, is only directed to measure the awareness level of the students at EMU, and target only in the five departments, which are related to the design of the built environment directly. It was not designed to provide information from other universities at TRNC or other departments which are a part of EMU. Hence, the results or the data obtained from this study might not be comparable to other studies/data obtained in other research context. Questionnaires have been conducted to measure the level of awareness of students for the purpose of this research.

Chapter 2

SUSTAINABILITY AND THE BUILT ENVIRONMENT

In this chapter, different dimensions of sustainability related to the built environment and higher education are discussed. Therefore, a brief explanation of the idea of sustainability related to the built environment has been firstly given. Since, sustainability in architecture can be achieved through a kind of interdisciplinary process in which collaboration of other disciplines are also needed; place of Architecture, Civil Engineering, Electrical Engineering, Mechanical Engineering and Interior Architecture also has been discussed.

2.1 Concept of Sustainability

Webster's dictionary defines sustainability as one of the methods which tries to apply and use resources while not endangering existence of them. In other words, such methods utilize resources in a way that they will not be deleted or permanently removed. Scholars define sustainability as kind of abilities or capabilities related to an issue which could maintain and sustain the related resources (Button, 1993), (O'Driscoll, Daugelaite, & Sleator, 2013). Generally the main concept of sustainability is to expresses those type of approaches which do not jeopardize the use of resources in future. Therefore, it has been mostly structured on a basic principle: "Everything that we need for our survival and well-being depends, either directly or indirectly, on our natural environment" (Cottrell, 2011). Heinberg (2010) defines sustainability to be of essences "which can be maintained over time". In other words, the main mission of sustainability is to maintain the existence and survival of those resources which are being used. It means that any kind of unsustainable societies cannot survive for long and will eventually fail. Sustainability is a concept which comes out of this fact that all the things that human beings need for their survival depends on the natural environment. The concept of sustainability plays an important role in creating an optimal harmony where human being and the environment could live together without any conflictions as long as possible. This harmony is expected to fulfill the social requirements for both present and future generations.

Following is another definition for sustainability discussed in an essay prepared by Brundtland Commission of the United Nations which is officially called the World Commission on Environment and Development. Their mission is to integrate countries all around the world to pursue sustainability.

The Brundtland Commission defines sustainability as "Development that meets the needs of the present without compromising the ability of future generations to meet their own needs" (Hariem Brundtland, 1985). The term has been used in the absence of agreement on a process which is desirable. This is exactly in contrast to the dominant outlook of the last hundreds of years, based on the view of the separation of the environment from socio-economics; the environment is seen external to humanity, to be used and exploited. Environmental problems were mainly local issues.

The Commission of Brundtland defines sustainability in an inspiring way in which it has been considered as both virtue and vagueness. It is called to be virtuous because it gives the impression that thinking of the wellbeing of future generations is something of great importance. On the other hand, the document leaves no specific hints on essence of sustainable societies which are reacting people in order to stay sustainable. So the definition keeps the door open for using the term “sustainability” in such way that they want it to be meant. Undoubtedly, growth of demands in consumption of resources in association with population growth are not possible to be sustained. These aspects, cannot be modified or revised by any social or governmental associations such as congresses, professional societies, or parliaments. The term “Sustainable Growth” is definitely an oxymoron. This is always true either it is used by a person on the street who is not highly educated, or by an economics expert, or by the President of the United States.

2.1.1 Sustainable Development and the Built Environment

Passing through the general discussions on the concept of sustainability, it is needed to be determined in terms of the built environment. Buildings provide safety and comfort for the users. To understand how they have to work for satisfying these needs, the human body preservation and reaction to interior environments should be our mentor. Obviously, we all contribute to the built environment in different ways. Therefore, components of the built environment are created based on our obtained experiences. Sometimes the substances of human actions are good and positive while sometimes it can be harmful and negative.

After the Brundtland Commission’s report in 1987 (which was already introduced on page 13), the term ‘sustainable development’ began to be used in association with politics. Although it might not be definitely concluded that this report brought ‘sustainable development’ into everyday language but it led the term to be passed into a kind of policy discourse. This report was the first overview of the global issues considering the environmental aspects of modern civilization by considering social, economic, and political perspectives. So it is known as a remarkable improvement on the scientific work of UNESCO’s Man and the Biosphere Program (MAB). Herman Daly, an American ecological economist, famously commented that sustainable development was an ‘oxymoron’. Now, 18 years after it was first introduced, the oxymoron has come of age.

To sum up, the relationship between people and environment was known as humanity’s victory over the nature. So far so, human knowledge and technology overcomes all, including natural and environmental obstacles. Environmental management and concern was based on natural resource management amongst key players. A key example is the ideas of Pinchot in the USA (Dryzek et al., 1997), which recognized that humans should manage their need for using the natural resources, rather than rapidly exploiting them, in order to ensure maximum long-term use. The concept of sustainable development is the result of the growing awareness of the global links between mounting environmental problems and socio-economic issues with poverty and inequality and healthy future of the human. It is the link between environmental and socio-economic issues.

In the next part; the table blew shows a summary of the different issues and the relationship of these issues to “sustainable” design or in other words design for sustainability.

Table 1. Definition of different sustainability issues (Stephen, 2015)

	Definition
Recycling	"The reusing of recycled or reclaimed water, including graywater, energy and any other recyclable material "
Minimization of waste being sent to the landfill	"Benefitting a suitable design, it is possible to help finite resources last longer."
Choosing food based on its environmental impact	"Building sites provide environments for a variety of plant and animal life forms. They also play a major role in food and water cycles, and their growth and change through the seasons help us mark the passage of time."
Water conservation	"Water conservation refers to the preservation, control and development of water resources, both surface and groundwater, and prevention of pollution."
Purchasing environmentally friendly products	"Specify materials and equipment that avoid fuel combustion and environmentally damaging refrigerants, as well as select insulation, upholstery, and other products made with environmentally benign materials."
Energy conservation	"Reduce greenhouse gases caused by power plants and building fuel consumption by designing for energy conservation and using clean and renewable energy sources."
Minimizing carbon emissions from transportation	"Transportation needs transportation tools, and these tools require fuel, as a result of fossil fuels consumption, carbon dioxide is produced. Transportation should be managed such that the amount of carbon dioxide is minimized."

2.1.2 Sustainable Design and the Design Equation

Since 1960s, environmental campaigners declared that preserving the Earth is an obligation for all human beings and everybody is required to participate and contribute in preventing carelessness and mistreatment (Margolin, 2007).

By 1996, Wackernagel and Rees stated that there are broad evidences that implied the world was in a state of "overshoot". This awareness shows that humanity's footprints had passed the tailor able capacity of the Earth. These surprising findings forced people to shift from being irresponsible to environment into being responsible to environment (Jones, 2008, p.5). “The acceptance by the majority of people in a changed belief, attitude, or way of doing things, resulted in a fundamental change in people’s worldview” (Bonda, 2003).

Consequently, the designers of the construction sites and environmental designers have to make appropriate decisions to take responsibility for their acts. According to Pidcock (2005) there is much evidence to show that there are many exciting opportunities to be realized, if the design industry turns to be keen on the modern paradigms of operation. The design industry is capable of taking a fresh look at problems and find a good design solutions which is creative and desirable (Pidcock 2005). However, adopting sustainable design methodology may bring a quite large number of challenges for designers. According to Hes (2005, p. 224) combining “green innovation” with “built environment” is a malefic problem for identifying the barriers which are hindering this methodologies as essentials (Aye, 2003; Mate, 2006).

The obstacles in applying sustainable design includes various costs, time limitation, lack of suitable education and training and understanding to mention a few (Aye, 2003&Mate, 2006). Studies also reported the client resistance (Aye, 2003), apart from the mentioned obstacles. The following obstacles may also exist every now and then in different conditions; understanding of the impact of consumed materials (Kang & Guerin, 2009b), reliable information and suitable tools” (Aye, 2003) or even the client demands (Hes, 2005), knowledge and call backs (Davis, 2001).

In the following table a summary of the literature review on design for sustainability and the barriers mentioned above by different scholars is presented.

Table 2. Summary of literature review

Author	Summary
Bonda (2003)	Suggests that “designers of the built environment need to take moral responsibility for what they do.”
Pidcock (2005)	“There is much evidence to show that if the design industry embraces the future with openness to new paradigms of thinking and doing, there are many exciting opportunities to be realized. She believes that the design profession plays an integral part in creating a future that maintains a healthy economy and attempts to save the world.”
Hes (2005)	“Integrating green innovation into the built environment is a “wicked” problem, which makes identifying barriers hindering this practice essential.”
Stieg (2006)	Designers should also “understand the effect of their activities and be responsible for their actions”. Designers should therefore understand the social and moral obligation associated with sustainable design while acknowledging that the practice of sustainable design presents various difficulties.”
Aye, 2003	“Identified multiple barriers to incorporate sustainable design into practice such as perceived cost time to source materials, education and training, understanding and in house experts.”

No matter what the obstacles are, it is very useful to look deeper into the concept of "Design for Sustainability". On one side what it means and on the other side what are the most important issues in the "design equation". There are different issues affecting "design equation" such as environment, cost, performance, and aesthetics. Therefore, it is important to be aware of environmental safety by considering the life cycle of the products while aesthetical issues also have to be considered. However, purchasing decision of the customers plays an essential role in this process without which even the most desirable products designed based on sustainable issues won't be accepted by the society.

2.1.3 Green Building

Having an overview on different arguments on sustainability of the built environment, Green Building as one of the important approaches to the idea of sustainable environment has been briefly discussed in this part. According to U.S. Environmental Protection Agency, "Green Building" is environmentally responsible and resource-efficient creation of structures and processes that are contributing to a building's life-cycle, including siting of the building, construction, operation, maintenance, renovation and deconstruction. Green building is associated with sustainable or high performance built of constructions.

Architecture, engineering and construction can significantly affect our lives as individuals, communities, nations or even as a world. The built environment needs to be economically, environmentally and socially sustainable, no matter what the scale is. It should be developed by means of knowledge and educations, tools and materials that improve sustainability in all steps of a building design. These issues and disciplines involved planning, design, construction and community management which all are inevitable parts of sustainable perspectives. Following is the explanation of the mentioned issues and stakeholders.

2.1.4 Key Concepts of Green Buildings

It is also important to mention that environmental studies suggest different concerns in a sustainable design. The need to concentrate on these items, by educating younger professions may lead to a more environmentally sustainable design which is highlighted in the following parts. The table on next page provides a list of the key issues and states on the third column on right how they are related to the five professions, which are the main forms of this study.

Table 3. Key concepts related to green buildings / sustainability (Stephen, 2015)

Key concepts related to sustainability	Definition	Related Profession
Energy & climate change	"Climates vary with the earth's position in relation to the sun and with latitude and longitude. The characteristics of a climate include the amount of sunlight, humidity and precipitation, and air temperature, motion, and quality. In addition, climates change over time; currently, we are experiencing a period of accelerated global climate change. Human activities, including building construction and operation, are adding greenhouse gases—pollutants that trap the earth's heat—to the normal atmosphere at a faster rate than at any time over the past several thousand years. Today, we are witnessing global climate change at an unprecedented rate."	Architecture, Civil Engineering, Electrical Engineering, Mechanical Engineering
Ecological choice &material	"Article author Douglas Wittnebel of Gensler (p. 136) predicts that "most, if not all, planned and constructed projects will be ecologically fingerprinted (like a new identification and approval system for appropriating energy and materials for design and construction).""	All of five professions

Environmental quality	Plants near buildings foster privacy, provide wind protection, and reduce sun glare and heat. They frame or screen views, moderate noise, and visually connect a building to its site. Plants improve air quality by trapping particles on their leaves. Particles are then washed to the ground by rain; photosynthesis assimilates gases, fumes, and other pollutants.	All of five professions
Biodiversity	"Humans are altering the composition of biological communities through a variety of activities that increase rates of species invasions and species extinctions, at all scales, from local to global. These changes in components of the Earth's biodiversity cause concern for ethical and aesthetic reasons, but they also have a strong potential to alter ecosystem properties and the goods and services they provide to humanity."	All of five professions
Integrated management of water	"Imagine a highly sophisticated building integrated modeling (BIM) software capable of calculating real-time energy and water use levels."	Civil, Mechanical and Electrical engineering
Indoor air quality	"Carefully site buildings to enhance daylighting as well as passive cooling by night ventilation, support opportunities for solar heating, improve indoor air quality, reduce use of electric lights, and add acoustic absorption."	All of five professions
Waste management	"The presence of people creates a major environmental impact. Buildings contribute to air pollution directly through fuel combustion and indirectly through the electric power plants that supply energy and the incinerators and landfills that receive waste."	All of five professions
Life cycle design	"Use of recycled materials; recycled when they are replaced".	Interior Architecture
Human comfort	"The professional ethics and responsibilities of the interior designer include the creation of healthy and safe indoor environments. An interior designer's choices can provide comfort for the building's occupants while benefiting the environment, an effort	Interior Architecture and Architecture

	that often requires initial conceptual creativity rather than additional expense".	

Designers of built environment can look at buildings as a whole; considering their envelopes, HVAC systems, lighting, equipment and applications, and renewable energy sources. The built environment building and product can all be sensitively designed for reuse and recycling.

2.1.5 Evaluating Sustainability: Certified Systems

Since, idea of Green Building as an approach for achieving sustainability has become one of the important concerns of recent years different certified systems of evaluating the sustainability of the built environment have been established. These systems not only evaluate the sustainability measures but also provide investors, architects and designers, construction personnel and building managers with information on green building technique and strategies. Below some of these systems, which practices in key countries are explained. Amongst those evaluation systems the two which are very frequently and widely used are BREEAM and LEED.

BREEAM which is known as BRE Environmental Assessment Method established in UK in 1993 sets the standard for achieving the best practice in sustainable building design and construction. It is also one of the foremost environmental assessment methods and rating system of the buildings in the world. The U.S. "Green Building Council", a nonprofit union on behalf of the building industry, has created a comprehensive system for building green called "LEED™", which stands for Leadership in Energy and Environmental Design. The "LEED program" provides information on green building techniques and strategies to designers, investors and architects, construction and building personnel and managers. Simultaneously, those buildings met the highest standards in economics and environmental concerns are certified by "LEED". This organization provides professional education, training, and accreditation as well. The other side of "LEED system" aims to recognize the individual's qualifications in "sustainable building" by Professional Accreditations.

One of the other well-known and practical building rating systems is GREEN GLOBE in Canada which began to work from 2000. It is a kind of revolutionary building environmental design and management tool which can be applied by delivering an online assessment protocol, rating system and guidance for green building design and operation.

CASBEE known as Comprehensive Assessment System for Building Environmental Efficiency is one of the other certified standards in the field of sustainability posed in Japan in 2001. It is a tool for assessing and rating the environmental performance of the built environment. AQUA is one of the other famous environmental certifications of more recent years in Brazil from 2007. This certification contemplates the adaptation of main principles of sustainability until its delivery and utilization by the customers.

These systems certify buildings that meet the highest standards of economic sustainability and environmental performance. At the same time most of them imply on an interdisciplinary collaboration for achieving a kind of sustainable built environment. On the other words, all effective specialists have to work together while lack of one of them will be resulted in an unsustainable design, management and operation. It is also becomes of this reason that, they also offer professional education, training and accreditation to all stakeholders of the design team.

2.2 Interdisciplinary Collaboration as a Means to Sustainability

Defining the idea of sustainable built environment and introducing it as an interdisciplinary term, it is important to clarify the role and collaboration of various disciplines. In the past, the only directly responsible experts for the design of the entire building were architects. Heating and ventilating was primarily made up of steam radiators and operable windows and there were quite uncomplicated lighting and power systems. Some parts of the buildings, such as sinks, bathtubs, cooking ranges, and dishwashers, were considered as separated items in the past. However, they are currently less portable and so more frequently considered as fixed parts of the building. As the time passed, portable oil lamps have been replaced by lighting fixtures tied into the electrical systems which become a fundamental part of the building.

Today, an architect typically leads and coordinates a big team of specialist consultants, including structural, mechanical, and electrical engineers, along with fire protection, acoustics, lighting, and elevator specialists. Interior designers may take parts in the work either as a part of the architectural team directly working for the architect, or as a consultant of the architect. Energy-conscious design requires the entire design team to closely coordinate each other of from the earliest design stages (Binggeli, 2009, P. 21). Following, is a brief discussion on different elements of the design team.

2.2.1 Architecture

Sustainability in architecture is defined as the procedures which lessen the destructive and malicious impact of constructions and buildings on the natural environment. Sustainable architecture considers the optimized use of energy, materials and development of space to create ideal harmony as well as control the negative influence and effect of constructions. In other words, sustainability in ecological design focuses on the current actions and decisions and prevents them from the upcoming consequences.

Sustainability in architecture has been referred to a variety of terms and criterion. Some of the most famous ones can be known as eco-housing, green development or green housing and sustainable design. However, the Rocky Mountain Institute, in its most recent issue of “Primer on Sustainable Building” described this new type of architecture by an interesting expression which states "taking less from the Earth and giving more to people."

In fact, green housing is a wide subject which could easily involve different ranges of various fields research and practice from energy efficiency and applying nontoxic finishes. In the following the major issues which are needed to be considered in green building philosophy related to architectural aspects are discussed (Stephen, 2015).

- “A Compact Envelope: Allows for very little surface area to be exposed to the external environment”. Thus, this provides the structure more economical when it comes to heating and cooling.

- “The Use of a Buffer Zone”: Between the core (living space) of a building and its exterior walls, such as the “design of a hallway or a laundry room, helping maintain comfortable conditions internally and saves energy”.

- “Wall Types: When wind hits a wall it produces a back flow at the base”, which if not sealed properly or if there was a designed opening, filtration into the building will occur. This will cause much energy loss and a draft inside.

- “Using Trees in the Landscape”: is a great way to buffer the strong north winds in the winter. Also, “a tree placed on the southern corner of a house allows for cooling in the summer and heating in the winter”.

- “Energy Efficient Wall Types”: that are “designed to reduce energy consumption during the year”. Some examples of these walls are the “tremble wall and water wall”, which absorb heat in the winter.

- “Using Glassy Walls”: in appropriate locations allows sunlight to enter the building in winter and to be blocked in the summer. This technique is inferred as “passive solar heating” and if done properly, will allow heating and cooling to occur during the related seasons.

- “Solar Panels”: Use of solar energy is by, an enhanced product that converts sunlight to heat and produce clean energy. In the long-term application, solar panels pay more for themselves.

- “Earth Rammed Homes”: Houses with walls backfilled with earth, are of great benefit for the serious economically-aware owners. “In these types of homes, the natural heating and cooling of the earth is utilized to preserve the internal temperature of the house” (Niroumand et al., 2013).

It worth mentioning that the topic of sustainable architecture is not a new one with all the developments done on it. It is said that the architects are mainly responsible for raising the awareness of the clients towards green housing strategies and sustainable architecture issues. On the other hand, if architects conduct green housing according to sustainable design, perhaps they would be successfully convince the client to pay the extra costs for that.

Though, according to (Rooke, Slessor, Fraser, & Thomson, 1998) this is the time for clients to get educated on green housing idea and to learn about sustainable design issues such as “sleek does not mean better” or “a glass wall is not better than a concrete wall.” Soon after, there comes a time when people have to stop being worried about the mere exterior details but they are supposed to be obsessed with internal aspects as well. "It is time to stop putting the fins on the Cadillac."

Following presents nine motivating ideas provided by the Hannover Principles of Architecture. These concepts should be seen as means of improving the quality of life through environmentally friendly architecture. In addition, these points are continuously changing, so they are possibly modified according to our latest knowledge on evolution of the world.

“Insist on rights of humanity and nature to co-exist in an appropriate sustainable condition.”

“Recognize interdependence. The elements of human design interact with and depend upon the natural world, with diverse implications at every scope.”

“Respect relationships between spirit and matter. Consider all aspects of human settlement such as community, dwelling, industry and trades in terms of generating connections between spiritual and material consciousness.”

“Accept responsibility for the consequences of design decisions on human well-being, the natural systems viability and their right for co-existence. Create safe objects of long-term value.”

“Eliminate the concept of waste. Evaluate and optimize the full life-cycle of products and processes, to approach the state of natural systems, in which there is no waste.”

“Rely on natural energy flows. Human designs should, like the living world, derive their creative forces from perpetual solar income. Incorporate this energy efficiently and safely for responsible use.”

“Understand the limitations of design. Treat nature as a mentor.”

“Seek constant improvement by the sharing of knowledge. Encourage open communication between colleagues, patrons, manufacturers and users to link long term sustainable considerations with ethical responsibility,” "re-establish the integral relationship between natural processes and human activity." (Table9)

2.2.2 Civil Engineering

Another essential discipline which is needed to be in collaboration with the others in order to achieve the most possible sustainable environment is Civil Engineering. Civil engineering focuses on both resources and fuel intensives which is why this type of engineering is regularly associated with resource efficiency.

Geotechnical engineering is the most important resource oriented areas in civil engineering. Those materials used in construction and design such as land use, steel and concrete on one hand and other resources such as different types of energies used over the centuries on the other hand, have resulted in dramatic changes in landscape. Therefore, improving the sustainability of geotechnical processes is extremely important for achieving overall sustainable development in addition to prevent the geotechnical projects from interfering with different social, environmental and economic issues.

It is important to notice that both the quality of the building itself and the environment beyond the building is affected by the selection of building materials. Considering the energy efficiency of a building, we should also pay enough attention to the embodied energy used to manufacture and transport the materials used to construct the building.

Very large quantities of water are used by power plants that supply electricity for buildings, which is returned at a warmer temperature, or as vapor. Metal and plastic materials, along with some clay are utilized by mechanical and electrical systems. These materials are commonly selected for their strength, durability, and fire resistance, as well as their electrical resistance or conductivity. But their environmental impact involves not only the energy cost to mine and fabricate them, but also the cost to transport them.

Sustainability-driven approaches in civil engineering lead to implementation of some fundamental purposes in practice:

- Dramatically reduce the environmental impact of our life and work
- Dramatically improve the environmental quality of what we create
- Maximize the utilization of materials and their reuse
- Maximize appropriate use of secondary and recycled materials
- Minimize waste in design, construction and use
- Minimize energy and water use
- Minimize pollution from all our activities
- Focus on increasing peoples' quality of life through good urban design
- Ensuring respect for people - showing care towards the workforce and the surrounding community.

2.2.3 Electrical Engineering

The other discipline which can collaborate with the others for achieving the most possible sustainable design is Electrical Engineering. Generally speaking, renewable sources of energy are natural resource types, which are able to be renewed by themselves with sufficient rate either through biological reproduction or through natural recurring processes. In this way, solar energy or wind turbines can be known as the good examples of renewable energy sources. On the other hand, none-renewable sources of energy (finite resources) cannot be renewed by themselves or if they do, it takes a very long time. Carbone-based fuels are amongst them. “Renewable electricity sources such as wind and solar power; systems for integrating renewable power into the grid; hybrid and electric vehicles; and energy efficient lights, motors, appliances, and heating and cooling systems are of great interest in todays’ life.”

Sustainable electrical engineering is focused on developing these types of energy resources. “Sustainability area coursework can easily provide additional knowledge of topics in energy generation, power electronics, control systems, and environmental issues.” It can also satisfy the needs for a certificate in sustainability. “Electrical engineers completing coursework in the sustainability concentrates on finding employment in the renewable energy industry, in the electric and hybrid electric vehicle industry, in power utilities, in consulting, and more generally, anywhere energy efficiency is a concern.”

Electrical designers need to be keenly aware of how to effectively integrate sustainable design criteria in their projects to make sure that built design will succeed in the future.

An electrical designer can also have a great influence in the project's with LEED certification in many areas, including light pollution reduction, fundamental commissioning of building energy systems, minimization of energy performance, optimized energy consumption, on-site renewable energy resources, enhanced commissioning, measurement and verification, and finally green power.

2.2.4 Interior Architecture

Overall, a sustainable interior architecture practice should be intended to minimize the negative impacts and maximize the positive outcomes of a reconstruction (Kang &Guerin, 2009b) through updating the old solutions with new technologies (Loftness etal., 2007). In this concept, similar to architects, also interior architects try to manage the use of energy, materials and spatial development in order to create ideal harmony . Particularly, there are three areas that deserve more attention in field of interior design known as climate change, non-sustainable use of raw materials and health issues. The better understanding of these issues is important to realize the complications of all the design decisions for the environment.

Interior designers are potentially able to make a greater impact on the environment than most individual performers do. It is simply because of their considerations on revising not only our own homes or workplaces but also those of our clients. The choices of materials, furnishings, energy sources and other resources that an interior architecture makes to operate in the natural world, can alter the balance that exists in the natural systems for better or worse.

The interior designer often meets with the architect and engineers in the preliminary stages of the design process. In this stage the interior design should be coordinated with new and existing plumbing, mechanical, and electrical system components. In addition, the location of plumbing fixtures, sprinklers, fire extinguishers, air diffusers and returns, and other items covered by plumbing and mechanical codes must be coordinated with interior elements. The plumbing, mechanical, and electrical systems are often prearranged at once, especially in large buildings. Vertical and horizontal chases are integrated into building cores and stairwells. Mechanical, electrical, and plumbing components are contained in suspended ceiling and floor systems. Furthermore, location of these components affect the selection and placement of finished ceiling, walls, and floor systems. (Binggeli, 2009, P. 25). Since water pollution is a big problem in the word as well as in Cyprus, protection of this vital resource is one of the main concerns here.

To sum up, due to the broad range of resources needed for implementing interior design, environmental sustainability is turning to be the main concern in that field (Ruff & Olson, 2009). Sustainable interior design methodologies are a set of actions such as arrangements on site selection; water use, energy use, and material selection while it is also intended to minimize the environmental impact of design (Rider, 2005). As a result, a physiologically and psychologically healthy indoor environment is created by the designers (Kang & Guerin, 2009a).

2.2.5 Mechanical Engineering

Mechanical Engineering is another discipline which plays an important role in creating a sustainable design by its collaboration with the others. Development of mechanical engineering has been vast during the recent decades. Although mechanical engineering has continued to proceed in its strengths in traditional disciplines including mechanics, thermal sciences, design, and manufacturing of systems, several other criteria have been developed consequently. A National Science Foundation-sponsored workshop recognized new guidelines in mechanical engineering which are categorized as subgroups of these four developing areas: Micro/nanotechnology, biotechnology, information technology, and ecology/energy. The study and practice of mechanical engineering requires improved methods that follow sustainable principles within both the traditional and emerging disciplines. Sustainable engineering is a multi-disciplinary field in mechanical engineering and its principles and practices. This area must be involved in different fields of mechanical engineering so that basic mechanical and thermal principles would become sustainable with enhancements of efficiencies in system. Products that utilize sustainable materials, which are still sustainable when they useful lives end, are design opportunities that can be developed. Besides, in order to ensure sustainable use of energy, these products must also operate at their peak efficiencies.

"Plumbing systems" of the entire building is closely related to other design approaches hence members of the plumbing industry, and the other key players are beginning to look at it as a whole. It is remarkable that such systems are now available. These are necessary in some areas that preserve the amount of storm "water run-off" from a site to match the predevelopment of natural run off from the site. But applying restriction on flow roof drains or "green vegetative roofs", the trend of whole plumbing helps the plumbing engineer for presenting good design options so far that can retain the water on the roof. Also, "water recycling systems" might be designed to collect the water and reuse it for irrigation or "toilet flushing systems". It is possible to develop ideas in designing pipe distribution systems which are able to return used water into the ground in green areas or parking lots.

Water efficiency concerns have led to making water free urinal products, and the widespread use of fixture manufactured by plumbing manufacturers. Because of their differences, variety of maintenance approaches are hired to be implemented. These fixtures are principally needed sustainable cases and require building approaches, and maintenance housekeeping staff, while the users should be aware of the matter. When all sides of the equation are aware of some particular requirements, the fixtures then can operate effectively for several years.

For water-free toilets, a small room next to the toilets is needed for the composting equipment. The number of building owners that coordinate these fixtures with the landscaping crew to use the compost on the facility landscape features is continuously increasing. The final outcome is a reduction of portable water to a facility and sewer waste from a facility. In addition, there are “low-flow showers” available in the markets. For a fashionable shower experience, production of multiple head shower systems provides the user with enough water. The effect of these systems on other building systems is notable. Weakly designed systems are the main reason of wasting the water and energy. There are also recirculation systems that re-circulate the shower water to use less water and energy which are analogous to whirlpool baths. “Green vegetative roofs” are good options to reduce the amount of “rain water run-off”.

These systems lessen the amount of storm water from a building and reduce the amount of drinkable water used in a building. Additionally there are specialty waste water separators that separate grease, fuel, acid and other hazardous materials from water streams and help reduce fresh “water pollution”. In order to have a properly operating system, close coordination between regulatory agencies, design team, construction team, and building operations is essential.

Another considerable issue in this field can be known as Temperature and Thermal Conditions. “Good Indoor Air Quality” (IAQ), “Heating and Cooling systems” (HVAC) is defined by the “Environmental Protection Agency” (EPA) and “National Institute of Occupational Safety and Health” (NIOSH) as the introduction and distribution of adequate ventilation air, control of airborne contaminants, and maintenance of “acceptable temperature and relative humidity” (Spiegel & Meadows, 2006).

“Indoor air pollution has several elements including materials, equipment, chemicals used as well as human activities and biological process” (Pilatowicz, 1995). Control (IAQ) is considered by “interior designers” (Kang & Guerin, 2009b). In this respect, Pilatowicz (1995) argues the following to be considered;

- One to two inches raise in the base of partitions from the floor.
- Delaying occupancy, it is good for that new materials release their harmful chemicals prior to occupancy.
- Considering the client's needs.

Being aware of the responsibility of the choices which are made, they mostly impact on human health, safety, well-being, and productivity (Pilatowicz, 1995). For instant, around 9 to 20% drop in related illness and almost 11% increase in productivity (Loftness etal., 2007) is reported if an enhanced ventilation system exist. Sick Building Syndrome (SBS) such has asthma, headache, or dizziness occurs as result of inappropriate design. Moreover “Multiple Chemical Sensitivity” (MCS) affects a few number of people who are sensitive to indoor air chemicals. By 2003, “Warsco and Lindsey” presented practical approaches for mold free interior environments aiming to minimizing cracks and fractures in millwork as well as providing nonporous materials to inhibit mold growth. In this relevance, a good source control system ensures the correct functioning of plumbing and air conditioning systems. For separation and filtration, various techniques can be used, applying barriers in the form of air pressure differences, transitional spaces in the form of vestibules, mudroom, air-lock entrances or breezeway or filters that able to eliminate a variety of pollutants. Ventilation ensured to keep a proper ratio of natural and mechanical air.

2.3 Education for a Sustainable Built Environment

The idea of sustainable development became mature between 1987 to 1992, as committees discussed, negotiated, and wrote the 40 chapters of Agenda 21. Initial considerations concerning ESD (Education Sustainable Design) were captured in Chapter 36 of Agenda 21, "Promoting Education, Public Awareness, and Training."

Unlike most other educational activities, ESD was firstly introduced by people outside the education communities. In fact, international political and economic forums (e.g., United Nations, Organization for Economic Co-operation and Development, Organization of American States) were the source of first major push for ESD. As the concept of sustainable development was discussed and formulated, it became obvious that education is the key factor of the concept of sustainability. Nowadays, in many countries, ESD is still being formed by people outside the education communities. In such cases, ministries, such as those of environment and health, develop the concepts and contents of ESD and afterwards pass them to educators to be delivered. Therefore, it is quite clear that education plays an important role in domain of sustainability. Since, the focus of this research is based on the collaboration of interior design with other design disciplines for the sake of sustainability; it seems necessary to explain this relation also in educational environments.

The parallel concept of supporting education for sustainable development is explored by the "UN General Assembly" in 1987. Therefor in the next part, focus is mostly on explaining the impacts of education on knowledge of the subject of sustainability.

There is a need for a kind of awareness about finite sources of energy, which has to be introduced from educational environments in order to be institutionalized in the society. Therefore, educators in the fields, which contribute to the design of the built environment have to be well-educated about the best ways of using energy in order to achieve the most possible sustainable design. Reaching to the best sustainable solution in design needs a kind of collaboration and cooperation of different disciplines involved in design process and construction field.

There are many studies and models available in literature on sustainable design education (Stieg, 2006). Identified sustainability indicates a gap between theory and practice; a sustainable teaching manual (revised in 2009) is published by the Council for Interior Design Accreditation (CIDA, 2006); Zuo et al. (2010) applied the performance-based design approach.

The study of Ruff and Olson (2009), which addressed the education issue in interior design shows that most communicators as professional designers thought the Earth's resources would renew themselves, and surprisingly many of them believed that man was superior to nature, and relied on technology to correct men's weaknesses. "While the students felt they could use sustainable products in commercial and residential projects, they still felt uncertain about directing clients to examples of sustainable homes" (Ruff & Olson, 2009). Interior design students should be prepared and trained with enough knowledge and information on sustainability to minimize environmental impact, reduce energy demand and create high-performance interiors.

Another way of relating the above information to educational issues is to understand deeper how learning works in architectural design education, which is mainly conducted in studios in a similar way that other design educations are directed. "Learning is conducted along a design activity", which is a form of problem-solving where individual decisions are made toward the fulfilment of objectives. However, "design problem solving differs from other problem-solving activities as it concerned with ill-defined problems" (Simon, 1979; Akın and Moustapha, 2004). From this point, it can be understood that, defining well the problems solved in the design studios, is a crucial educational act for studio instructors. If, the educators, evolve the project topics around sustainability, or in other words, if they base the problems solved in student work on ethical concerns based on sustainability, the learning perspective of the students will also be affected.

Educators are expected to re-organize their curriculum and to introduce more digital technologies, such as building-performance simulation tools based on recent developments and emerging tools in design practice.

To sum up, this chapter gathered a kind of literature survey to identify the idea of sustainability which is mostly about re-usage and correct ways of using energy sources. Green building can be known as a respond to the need of sustainable built environment which cannot be achieved without the close collaboration of different participatory teams in design and construction process. Since, each of these participants from different fields are dealing with the issue of energy in various ways it is needed from the specialists in each discipline to collaborate with the others.

Achieving sustainability for the sake of the most energy-efficient built environment by the means of interdisciplinary collaboration has to be a part of educational curriculums. Undoubtedly, it is needed to increase people's awareness in order to be able to bring this kind of attitudes into practice. Especially, educators in different collaborative disciplines have to be aware of their role in this process.

Finally from all of the mentioned definition, it can be concluded that investigating the interaction between different sections in construction of sustainable building is necessary. Therefore, measurement of the awareness of participants in a project process from different fields who are supposed to cooperate together in a single project is an essential task. In next chapter, the method for performing this task is examined.

Chapter 3

METHODOLOGY

In the following section purpose of the research has been highlighted, sample selection method, research approaches and strategy has been described, followed by the survey design, data collection and analysis methods. The research has been conducted to investigate the awareness of the five professions which are involved in building a sustainable construct, naming: Architecture, Civil Engineering, Electrical Engineering, Interior Design and Mechanical Engineering. Since designing the standard and sustainable building must be done by the cooperation of all these related principles, the knowledge and awareness of all and each of these departments are signified.

3.1 Subjects Selection

As the main objective of this study is to measure the awareness level of the graduating students of five departments of EMU (Architecture, Civil Engineering, Electrical Engineering, Interior Architecture and Mechanical Engineering) the subjects were selected as all of the graduating students who are almost ready to get their diploma and start their profession in the relevant fields. The total number of 129 student participated in this research, as mentioned, the last year student were selected for this study. The normal duration of bachelor in all departments is 4 years (8 semesters) however sometimes it can be extended. The participating student in our study were mainly in their 7th, 8th or 9th semester which is corresponding to the last year studies or last year study with one semester of extension. The data is collected in from December 2014 and January 2015 for a duration of almost 2 months. The departments are main engineering departments at EMU since 1984 with the largest population of the students amongst all the other departments. In Table 4 on page 47, a summary of the number of participating student in this research together with participation percentage and the numbers related to distribution and collection of these questionnaires in detail is given.

3.2 Research Approach

The first step for getting familiar with the content of each program was investigating their curriculum. For this purpose, the web site of each department is used as the reference of the program and the related curriculums is obtained. Investigating these curriculums provided a background about the content of each program as well as the knowledge area of the students of each department. It caused a good adjustment in our expectation about the knowledge of these students, for more information about the curriculum of each program please refer to the Appendix 3. As the main objective of this study is to measure the level of awareness about sustainability amongst students, quantitative method has been chosen as the most suitable strategy for approaching this goal. Our survey research has been conducted to measure the awareness and collaboration level of the graduating students which allows the researcher to evaluate the level of variables of amongst 5 different sample group from different departments and compare their results. Also to gain a statistical data, to be used to describe studied phenomenon (awareness level of the student about the sustainability as well as their knowledge about cooperation possibilities between their professional section with other professions mentioned in this research) throughout numerical data (Babi etal., 2014). Therefore the study is categorized as a descriptive research, as the measurement of awareness has been described by means and numerical data.

Sustainability concepts are an increasing topic amongst the scholars and researchers, and still there exist no comprehended standardized tools to assess the knowledge of the students on the sustainability issues although universities have been developing a tool to measure environmental sustainability knowledge. In this study it was decided to investigate sustainability knowledge level in our university to find out to what extend EMU has succeeded in providing enough knowledge for the students. After consulting with my supervisor, and investigating the questionnaires which were used by Arizona University, Seattle University and University of Maryland for such investigating, it was decided to use the Arizona University Questioners. The reason for this choice is the similarity of the universities structure, mainly because of the availability/ accessibility of the survey through internet. The other reason for taking this survey as a guide was that the Arizona University has been repeatedly using this survey for several years. That was considered as a sign that the questions were more or less tested and verified as “good” questions. However there was still a need to adopt this survey to the context of this study. Therefore a subset of questions which were directly aligned with the purpose of this study, were developed modified and revised several times. Finally, the questions were reconsidered as appropriate for using for the pilot study. (it is necessary to mention once again that the comparison of the results of this survey with other universities has not been the target of this current study).

The questionnaire included sixteen questions of which eight of them were directly related to our sustainability study. Of this eight questions, one and two are considered as warm-up questions, question three is about the departmental information. Question four and five are related with the subject's personal interests while in question six the level of their personal awareness about sustainability is measured. Question seven and eight are EMU related questions. Question nine checks the background of the subjects about the sustainability related issues. In question ten the awareness level of the subject about the design equation is evaluated. By proceeding to question eleven and twelve, the subject is evaluated based on his/her knowledge of the importance of key player in sustainable industrial construction (stakeholders). In question thirteen and fourteen, the knowledge level and information of the subject about renewable resources as a key components for sustainability is measured. Finally in the last two questions of the survey, the knowledge of the subject about systematic approaches and impacts of it in transmitting the knowledge (in our particular case; sustainability) is evaluated.

The study is performed through investigating and analyzing the data obtained from questionnaires distributed among the graduating students of EMU.

3.3 Data Collection Procedure

As explained in the research strategy, considering the obtained information related with the program contents from their curriculums , a questionnaire, was developed to measure the level of awareness of students for the purpose of this research. Pilot study has been done in a smaller group, naming academic staff and researchers in the EMU. This step helped the improvement of the quality of the questionnaires, as well as its adjustment to the environment of EMU in Northern Cyprus. Questionnaires have been distributed via the management of each department to all the graduating bachelor students. Total number of 129 questionnaires has been gathered of which 95 numbers of questionnaires was usable. Table 4 describes the participation percentage and the numbers related to distribution and collection of these questionnaires in detail.

Table 4. Participation percentages

Department	Number surveys distributed	Number of surveys collected	Percentage of participation
Architecture	40	25	62.5
Civil engineering	30	19	63.4
Electrical engineering	27	25	92.5
Interior architecture	15	13	86.60
Mechanical engineering	17	13	76.47

As it is obvious from the table representation, the maximum participation belongs to Electrical Engineering, Interior Architecture and Mechanical Engineering although they have the smallest population of the students accordingly while Architecture and Civil Engineering have shown less interest in participating in the survey. The analysis of the collected data is put in the following.

3.4 Data Analysis

After the answers to the questionnaires were collected the next task was analyzing the collected data so that drawing the conclusion of the research was made possible. Finding out which proportion of the students participated in the experiment and what was their awareness level about sustainability concept and implementation of it was(considering our expectations about their knowledge based on the program curriculum) the main interest. Therefore, initially by giving an equal weight to all the answers of the questions, the SPSS software and MINITAB were used for analyzing the data and calculated their contribution in the study percentage as well as assessing their awareness level and their knowledge about cross functional usage of their skill for the sake of sustainable built constructions.

However this method of analyzing the results, revealed two problems;

1) The software analysis of the data returned fractional measures, and since our case subjects are human individuals, having fractional numbers wasmeaningless.
2) Secondly, after discussing the results with the experts it was cancluded that the weight of all questions are not equal, which means the answers of some questions carried more importance when compared to the other ones.

From this two points, it was decided to modify the methodology and the results. Therefore a second step approach, an appropriate weight for each answer in each question was defined. The full description of the weight of each answer in each question is discussed in Chapter 4.

After this step using Microsoft Excel there results were analyzed and by manual calculations they were modified. The outcomes were related to the following questions:

1) What was the level of awareness about sustainability amongst students of each department?
2) To which extend the students of each department know about their cooperation possibilities in sustainability related fields?
3) What proportion of the student participated in the research?
4) The students of which department have the maximum awareness?

This information provided a good background to contribute positively in building sustainable constructions by different means such as providing suggestions, methods or strategies for improving the skills of the key stakeholders of this issue which are mainly university graduates from the studied departments. In the next chapter of this study, the results are presented in detail and then discussed thoroughly .

Chapter 4

RESULTS

The aim of this study was to investigate the awareness level of the graduating students at EMU, at five different departments, which provide education related to the design of the built environment in regards to sustainability. In addition, this study also tried to find out the graduating students' opinions on the cooperation of different involved design team members/professions. To make further reading easier, the names of the departments and their shortened names are listed below:

- Department of Architecture (**DA**)
- Department of Civil Engineering (**DCE**)
- Department of Electrical Engineering (**DEE**)
- Department of Interior Architecture (**DIA**)
- Department of Mechanical Engineering (**DME**)

The questionnaire was primarily developed from the key-words found through literature survey and other sustainability literacy surveys, which were done earlier at other universities. The questionnaire was given to the students 98 and 95 were returned. The answers given to each question were tabulated and analyzed in general, in percentages and later with special points (scores/coefficients) for sustainability awareness.

In this chapter, firstly in part **4.1 Results of Data Analysis**; the numerical results of the graduating students' survey are presented. Secondly, in part **4.2 Results of**

Sustainability Awareness; the results showing the awareness levels of sustainability based upon the analysis with the given sustainability coefficients; according to each department are introduced. Thirdly, in part **4.3** results related to student views on cooperation are presented. Finally, in part **4.4** a short summary of the results, together with a brief discussion of the findings is provided.

4.1 Results of General Data Analysis

In this part, the general survey results are illustrated and explained one by one for each question. A short statement or summary by the researcher is provided after each table.

The first two questions were designed as warm up questions and asked general demographic information about the students who participated in the survey. In other words, they did not directly aim to find out any significant data about the awareness level for the students, but were hoped to help the students while getting used to answering the questionnaire questions.

The first question was related to finding a general age average for graduating students at EMU. The question was, "**Please indicate your age"** and the possible answers were; "**20 – 30**"; "**30 – 40**" and "**over 40**".

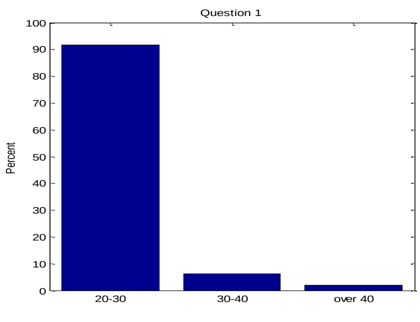

Figure 1. Age distribution

The results show that, even though there are some exceptions, the majority of the graduating students at EMU, at the five different departments, have ages between 20-30 years.

Similar to question 1, the second question was also a demographic, warm up question. It asked the students to **indicate** their **nationality**.

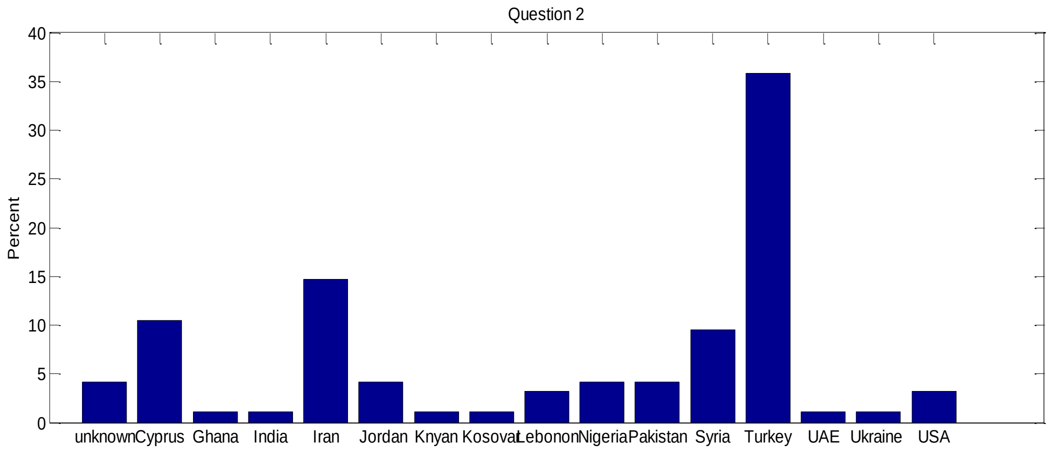

Figure 2. Nationality distribution

The graph above summarizes the results and shows that most of the students (around 35%) contributing to the survey are from Turkey. In the second most are Iranians (15%) followed by Cypriots and Syrians (both around 10%). These students are followed by students from Jordan, Nigeria, and Pakistan (all around 5%). The other nationalities/countries, which were represented in the survey under 5% were as follows: Ghana, India, Kenya, Kosoca, Lebanon, UAE, Ukraine and USA.

The third question was the question from the series of the general information focused questions but at the same time, the first question, which was directly related to the survey aim. It aimed to find out how many graduating students from which department participated in the survey. This question was presented as follows: **“3. please indicate your department at EMU”**. The possible answers were:

- Architecture
- Civil Engineering
- Electrical Engineering
- Interior Architecture
- Mechanical Engineering

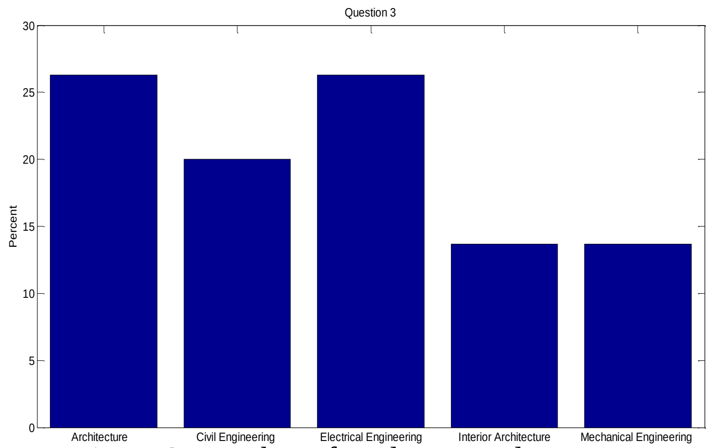

Figure 3. Number of students per department

Figure 3, illustrates the general distribution of the number of students according to the departments. With 25 students, Architecture and Electrical Engineering are the two departments, which participated with larger numbers.

They are followed by the DCE, which participated with 19 students. DIA and DME participated in the survey with equal and least numbers of graduating students; each with 13 students. In the next part, the results related to questions 4 and 5 are presented. These two questions were formulated in order to discover the personal interest levels of students in regards to sustainability issues and to find out to which extend they make an effort to be knowledgeable about them. Question 4 asked:

“**Please indicate which of the following statements best describes your level of interest in sustainability”.**

- I have a passion for sustainability
- I have considerable interest in sustainability
- I am neither interested nor disinterested in sustainability (neutral)
- I have little interest in sustainability
- I have no interest in sustainability

Table 5. Question 4 results

Answer	Architecture (25stds)		Civil (19stds)		Electrical (STDS 25)		Interior (STD S13)		Mechanical (STDS 13)	
		percentage		%		%		%		%
a. I have a passion for sustainability	8	32%	5	26.31%	12	48%	3	23.7%	3	23.07%
b. I have considerable interest in sustainability	12	48%	10	52.63%	5	20%	7	53.84%	8	61.53%
Subtitle answer (a&b)	***20***	***80%***	***15***	***78.94%***	***17***	***68%***	***10***	***76.92%***	***11***	***84.61%***
I am neither interested nor disinterested in sustainability (neutral)	4	16%	3	15.78%	3	12%	1	7.69%	1	7.69%
I have little interest in sustainability	1	4%	0	-	**3**	**12%**	1	7.69%	1	7.69%
I have no interest in sustainability	0	-	1	5.26%	**2**	**8%**	0	-	0	-
No answer	0	-	0	-	0	-	1	7.69%	0	-

As can be seen in the table above, the results show that the students from the DME are the most concerned (around 85%) students about sustainability. The least interested ones are the ones from the DEE (68%).

However, it can be mentioned that, majority of students in all departments are either passionate or interested in sustainability as shown in the third row of the table.

Question 5 was very similar to question 4 and it asked: “**Please rate your level of agreement with the following statements**”. A Likert-type scale was provided on this question. The scale used for this question ranged from “strongly agree”, “agree”, “neutral”, “disagree”, to “strongly disagree”.

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I make an effort to be knowledgeable about environmental issues	☐	☐	☐	☐	☐
I make an effort to be knowledgeable about sustainability issues	☐	☐	☐	☐	☐
My daily behavior reflects a concern about sustainability issues	☐	☐	☐	☐	☐
I value knowing that my food is grown locally	☐	☐	☐	☐	☐
I think about how and where my clothes are made	☐	☐	☐	☐	☐
I would like to learn more about sustainability while in University	☐	☐	☐	☐	☐

Results of question 5 are shown in tables 6 – 10, for each department separately.

Table 6. Question 5 results for the Department of Architecture

Architecture (STDS 25)	1.Strongly Agree		2.Agree		*Percentage 1+2*		Neutral	Disagree	Strongly Disagree
		%		%					
I make an effort to be knowledgeable about environmental issues	5	20%	15	60%	***20***	***80%***	5	0	0
I make an effort to be knowledgeable about sustainability issues	6	24%	11	44%	***17***	***68%***	8	0	0
My daily behavior reflects a concern about sustainability issues	4	16%	11	44%	***13***	***52%***	10	0	0
I value knowing that my food is grown locally	3	12%	9	36%	***12***	***48%***	9	4	0
I think about how and where my clothes are made	2	8%	10	40%	***12***	***48%***	10	2	1
I would like to learn more about sustainability while in University	3	12%	15	60%	***18***	***72%***	4	3	0

According to Table 6 most of the students from DA are active in learning more about environmental and then sustainability issues. They also expect the university to play an active role in teaching them about sustainability. When the case is taking actions in daily life such as food and clothes, almost half of the students seem to consider the matter.

Table 7. Question 5 results for Department of Civil Engineering

Department of Civil Engineering (total 19 students)	1.Strongly Agree		2.Agree		*Percentage 1+2*		Neutral	Disagree	Strongly Disagree
I make an effort to be knowledgeable about environmental issues	7	% 36.84%	8	% 42.10%	***15***	***78.94%***	4	-	-
I make an effort to be knowledgeable about sustainability issues	4	21.05%	9	47.36%	***13***	***68.42%***	6	-	-
My daily behavior reflects a concern about sustainability issues	3	15.78%	9	47.36%	***12***	***63.15%***	6	1	-
I value knowing that my food is grown locally	2	10.52%	6	31.57%	***8***	***42.10%***	7	4	-
I think about how and where my clothes are made	2	10.52%	6	31.57%	***8***	***42.10%***	6	4	1
I would like to learn more about sustainability while in University	-	-	6	31.57%	***6***	***31.57%***	6	-	1

In the table above, statistics for DCE is presented. Again most of the students believe that, they try to learn about environmental and sustainability subjects.

A significant percent of the students also believe that they behave “sustainable” in their daily lives.

For the DEE, results are shown in table below. Making effort in learning about environmental issues is the matter of importance for majority of students in this department. They also try to be more aware about sustainability as well as behave sustainable in daily life. The locally grown food is important for most of the students.

Table 8. Question 5 results for Electrical Engineering Department

Electrical (25 STDS)	1.Strongly Agree		2.Agree		*Percentage 1+2*		Neutral	Disagree	Strongly Disagree
I make an effort to be knowledgeable about environmental issues	9	% 36%	11	% 44%	***20***	***80%***	4	0	1
I make an effort to be knowledgeable about sustainability issues	5	20%	11	44%	***16***	***64%***	6	2	1
My daily behavior reflects a concern about sustainability issues	3	12%	13	52%	***16***	***64%***	7	1	1
I value knowing that my food is grown locally	8	32%	9	36%	***17***	***68%***	6	1	1
I think about how and where my clothes are made	8	32%	5	20%	***13***	***52%***	10	0	2
I would like to learn more about sustainability while in University	4	16%	8	32%	***12***	***48%***	9	1	3

DIA students seem to be the more concerned and active students than the previous ones in the field of environmental and sustainability issues. Only, less than half of the students care about how and where their clothes were made.

Table 9. Question 5 results for Interior Architecture Department

Interior (13 STDS)	1.Strongly Agree		2.Agree		*Percentage 1+2*		Neutral	Disagree	Strongly Disagree
I make an effort to be knowledgeable about environmental issues	2	% 15.38%	8	% 76.93%	***10***	***76.93%***	3	-	-
I make an effort to be knowledgeable about sustainability issues	3	23.07%	6	46.15%	***9***	***69.23%***	4	-	-
My daily behavior reflects a concern about sustainability issues	1	7.69%	7	53.84%	***8***	***61.53%***	4	1	-
I value knowing that my food is grown locally	3	23.07	6	46.15%	***9***	***69.23%***	3	1	-
I think about how and where my clothes are made	1	7.69%	5	38.46%	***6***	***46.15%***	4	3	-

I would like to learn more about sustainability while in University	2	15.38%	6	46.15%	***8***	***61.53%***	4	1	-

Table 10. Question 5 results for Mechanical Engineering Department

Mechanical (STDS 13)	**1.Strongly Agree**		**2.Agree**		***Percentage 1+2***		**Neutral**	**Disagree**	**Strongly Disagree**
		%		%					
I make an effort to be knowledgeable about environmental issues	2	15.38%	9	96.23%	***11***	***84.61%***	2	-	-
I make an effort to be knowledgeable about sustainability issues	-	-	10	76.93%	***10***	***76.93%***	3	-	-
My daily behavior reflects a concern about sustainability issues	1	7.69%	9	96.23%	***10***	***76.93%***	1	2	-
I value knowing that my food is grown locally	2	15.38%	8	61.53%	***10***	***76.93%***	3	-	-
I think about how and where my clothes are made	3	23.07%	7	53.84%	***10***	***76.93%***	3	-	-
I would like to learn more about sustainability while in University	3	23.07%	9	69.23%	***12***	***92.30%***	1	-	-

The results regarding question 5 in the above table are related to DME. Majority of them try to learn more about the subjects and at the same time take actions in their daily life to be sustainable. They also expect to learn about the topic in the university.

Question 6, was the first question in the questionnaire, which was related to sustainability, at a personal scale. It sounded as follows:

"Please indicate the degree of importance you place on the following personal sustainability issues".

	Very Important	Important	Neutral	Unimportant	Very Unimportant
Recycling	☐	☐	☐	☐	☐
Minimization of waste being sent to the landfill	☐	☐	☐	☐	☐
Choosing food based on its environmental impact	☐	☐	☐	☐	☐
Water conservation	☐	☐	☐	☐	☐
Purchasing environmentally friendly products	☐	☐	☐	☐	☐
Energy conservation	☐	☐	☐	☐	☐
Minimizing carbon emissions from transportation	☐	☐	☐	☐	☐

Tables from 11 - 15 present the results to question 6 separately for each department.

Table 11. Question 6 results for Architecture Department

Architecture(25)	V. Import		Important		Total %		Neutr	Un-impo	V. Un-imp
		%		%		%			
Recycling	11	**44**	11	**44**	22	**88**	3	-	-
Minimization of waste being sent to the landfill	9	**36**	9	**36**	18	**72**	7	-	-
Choosing food based on its environmental impact	10	**40**	7	**28**	17	**68**	8	-	-
Water conservation	10	**40**	11	**44**	21	**84**	4	-	-
Purchasing environmentally friendly products	6	**24**	13	**52**	19	**76**	5	1	-
Energy conservation	13	**52**	6	**24**	19	**76**	6	-	-
Minimizing carbon emissions from transportation	11	**44**	5	**20**	16	**64**	9	-	-

Architecture students give more importance to recycling and water conservation. However, all other issues are also important for a significant percent of the students.

Table 12. Question 6 results for Civil Engineering Department

Civil (STDS 19)	Very Important		Important		Total percentage		Neutral	Unimpor	Very Unimp
Recycling	8	%	9	%		%	2	-	-
		42.10%		47.36%	17	**89.47%**			
Minimization of waste being sent to the landfill	6	31.57%	7	36.84%	13	**68.42%**	6	-	-
Choosing food based on its environmental impact	5	26.31%	6	31.57%	11	**57.89%**	4	3	1
Water conservation	10	52.63%	8	42.10%	18	**94.73%**	-	1	-
Purchasing environmentally friendly products	6	31.57%	7	36.84%	13	**68.42%**	5	1	-
Energy conservation	7	36.84%	7	36.84%	14	**73.68%**	4	1	-
Minimizing carbon emissions from transportation	9	47.36%	5	26.31%	14	**73.68%**	3	1	1

Table 12 illustrates the results in DCE. Again recycling and water conservation are the most important subjects for these students. But they seem to care less about the food.

Table 13. Question 6 results for Electrical Engineering Department

Electrical (25 STDS)	Very Important		Important		Total percentage		Neutral	Unimportant	Very Unimportant
Recycling	7	%	10	%		%	5	1	2
		28.00%		40%	17/25	**68%**			
Minimization of waste being sent to the landfill	6	24%	5	20%	11	**44%**	10	-	4
Choosing food based on its environmental impact	6	24%	7	28.00%	13	**52%**	7	2	3
Water conservation	7	28.00%	9	36%	16/25	**64%**	4	2	3
Purchasing environmentally friendly products	7	28.00%	6	24%	13/25	**52%**	8	1	3
Energy conservation	5	20%	12	48%	17/25	**68%**	2	3	3
Minimizing carbon emissions from transportation	6	24%	7	28.00%	13	**52%**	5	3	4

Table 14. Question 6 results for Interior Architecture Department

Interior (STDS 13)	V. Important		Important		Total percentage		Neutral	Unimpor.	Very Unimpor.
Recycling	7	% 53.84 %	2	% 15.38 %	9/13	% **69.23%**	2	1	1
Minimization of waste being sent to the landfill	4	30.76 %	4	30.76 %	8/13	**61.53%**	4	1	0
Choosing food based on its environmental impact	2	15.38 %	6	46.15 %	8/13	**61.53%**	3	2	0
Water conservation	4	30.76 %	4	30.76 %	8/13	**61.53%**	4	1	0
Purchasing environmentally friendly products	4	30.76 %	7	53.84 %	7/13	**84.61%**	2	0	0
Energy conservation	3	23.07 %	6	46.15 %	9/13	**69.23%**	3	1	0
Minimizing carbon emissions from transportation	0		4	30.76 %	4/13	**30.76%**	6	0	0

As shown in table 13 students from DEE have concerns on both recycling and energy conservation. The next most important issue is water conservation.

In Table 14 results of DIA students are presented. Environmentally friendly products are the most important issue for students in this department. Secondly, recycling and energy conservation are the matters of concern.

Table 15. Question 6 results for Mechanical Engineering Department

Mechanical (STDS 13)	Very Important		Important		Total percentage		Neutral	Unimportant	Very Unimportant
Recycling	8	% 61.53 %	5	% 38.46 %	% 13/13	100%	-	-	-
Minimization of waste being sent to the landfill	8	61.53 %	3	15.38 %	11/13	**84.61 %**	-	-	-
Choosing food based on its environmental impact	8	61.53 %	4	30.76 %	12/13	**92.30 %**	-	-	-
Water conservation	5	38.46 %	7	53.48 %	12/13	**92.30 %**	-	-	-
Purchasing environmentally friendly products	7	53.48 %	2	15.38 %	9/13	**69.23 %**	-	-	-
Energy conservation	6	46.15 %	7	53.48 %	13/13	**100%**	-	-	-
Minimizing carbon emissions from transportation	9	69.23 %	3	15.38 %	12/13	**92.30 %**	1	-	-

In table above the results for DME is represented. Majority of the students from DME have significant concerns on all sustainability issues. All of them give importance to recycling and water conservation.

7. Are you aware of any sustainability initiatives at EMU?

☐Yes ☐No

Table 16. Question 7 results for all Departments

Departments	Yes	Percentage	No	Percentage
Architecture (25)	14	56.00%	11	44%
Civil (19)	7	36.84%	12	63.15%
Electrical (25)	11	44%	14	56.0%
Interior (13)	5	38.46%	8	61.53%
Mechanical (13)	10	7.92%	3	23.07%

Regarding question number 7, it seems that most of the students are not aware of any sustainability initiatives in EMU. The most aware students are in AD.

8. If yes, please indicate on which of the following issues

□ Recycling minimization of waste being sent to the landfill
□ Choosing food based on its environmental impact
□ Water conservation
□ Purchasing environmentally friendly products
□ Energy conservation
□ Minimizing carbon emissions from transportation
□ Other *(One student mentioned Environment Club)*

Table 17. Question 8 results for all Departments

	Architecture 25	**Civil 19**	**Electrical 25**	**Interior 13**	**Mechanical 13**
Recycling minimization of waste being sent to the landfill	3	2	7	3	0
Choosing food based on its environmental impact	7	2	10	1	1
Water conservation	9	7	5	4	4
Purchasing environmentally friendly products	4	2	8	1	1
Energy conservation	7	3	7	2	7
Minimizing carbon emissions from transportation	4	1	2	0	1
Other…	I haven't seen any of these	Environment clup	-	-	-

It could be seen from the table above that students in different departments have different ideas regarding sustainability initiatives. Students from DME are mostly aware about energy conservation while architectures and civil engineers know about water conservation.

9. Of the following sustainability related terms, programs or practices please mark the ones that you already knew before taking this survey. (Please select all that apply).

☐Energy & climate change

☐ Integrated management of water

☐ LEED

☐ Ecological choice &material

☐ Sick building syndrome

☐ Green design

☐ Environmental quality

☐Indoor air quality

☐Life cycle design

☐ Biodiversity

☐ Waste management

☐ Human comfort

Table 18. Question 9 results for all Departments

	Architecture 25		Civil 19		Electrical 25		İnterior 13		Mechanical 13	
		percentage		%		%		%		%
Energy & climate change	14	***56.00%***	13	**68.42%**	10	40%	6	***46.15%***	11	**84.61%**
Ecological choice &material	17	**68%**	3	15.78%	6	24%	3	23.07%	3	23.07%
Environmental quality	13	***52%***	10	**52.63%**	4	16%	6	***46.15%***	6	***46.15%***
Biodiversity	4	16%	4	21.05%	3	12%	3	23.07%	2	15.38%
Integrated management of water	7	28%	1	**5.26%**	5	20%	1	**7.69%**	2	15.38%
Sick building syndrome	5	20%	2	10.52%	5	20%	2	15.38%	3	23.07%
Indoor air quality	14	***56%***	5	26.31%	16	**64%**	5	38.46%	4	30.76%
Waste management	9	36%	11	***57.89%***	6	24%	2	15.38%	4	30.76%
LEED	5	20%	1	**5.26%**	2	**8%**	1	**7.69%**	1	**7.69%**
Green design	16	**64%**	8	42.10%	7	28.00%	5	38.46%	6	***46.15%***
Life cycle design	7	28%	3	15.78%	5	20%	2	15.38%	1	**7.69%**
Human comfort	17	**68%**	3	15.78%	5	20%	5	20%	7	***53.84%***

According to table 18, students from DA have prior knowledge about “ecological choice & materials” and “human comfort” more than other items. DCE students before taking the survey, were most aware of the concepts related to “energy and climate change”, followed by an awareness on “environmental quality” and “waste management”. On the other hand, they least heard of “integrated management of water” and “LEED”. Students from DEE, show an indication, related to an awareness on “indoor air quality issues”. DIA students, have very low percentages related to most issues. They show a slight inclination towards a prior sensitivity about environmental issues. Students of DME are mostly aware of “energy & climate change”. This item has the highest percentage of amongst all other items – 85%.

This question had a key role within the whole survey. It is the question, where the key concepts related to sustainability of the built environment are presented and the awareness of the students gently tested. The results of this question will further be discussed in part 4.3.

10. **What do you think is the most important issue in the `design equation`?**

□ Environment □ Cost □ Performance □ Aesthetics □ Other

Table 19. Question 10 results for all Departments

	Architecture 25		**Civil 19**		**Electrical 25**		**İnterior 13**		**Mechanical 13**	
Environment		%		%		%		%		%
	9	36%	8	42.10%	7	28.00%	5	38.46%	5	38.46%
Cost	7	28.00%	13	**68.42%**	7	28.00%	1	**7.69%**	4	30.76%
Performance	15	**60%**	5	26.31%	11	44%	3	23.7%	8	**61.53%**
Aesthetics	3	12%	3	15.78%	2	**8%**	6	**46.15%**	2	15.38%
Other	Ergonomic		Noise pollution		-	-	-	-	comfort	

Table 19, illustrates the results for question number 10. Students from DA consider "performance" as the prominent feature in design. For students of DCE the most important matter is the "cost". Mechanical engineering students also think that "performance" is the most important issue. Environment matters the least for students from DEE. Around 36-40% of all the other students care about environment. The students who care most about the environment are from the DCE (%42). Out of all the departments, DIA students care most and almost only about "aesthetics" (%46) and least about "cost"(%8).

11. **Please rate the importance of the stakeholders involved in the construction industry in relevance to sustainability of the built environment.**

☐ Very Important ☐ Important ☐ Neutral ☐Unimportant ☐Very Unimportant

Table 20. Question 11 results for all Departments

	Architecture (25)		Civil (19)		Electrical (25)		Interior (13)		Mechanical (13)	
Very Important	2	% 8%	2	% 10.52%	2	% 8%	1	% 7.69 %	1	% 7.69%
Important	16	**64%**	11	**57.89%**	12	48%	7	53.84%	10	**76.92%**
Total percentage	18/25	**72%**	13/19	**68.42%**	14/25	56.00%	8/13	61.53%	11/13	**84.61%**
Neutral	7	28%	5	26.31%	7	28%	4	30.76%	2	15.38%
Unimportant	0	-	0	-	4	16%	0	-	0	-
Very Unimportant	0	-	1	5.26%	0	-	1	7.69%	0	-

Results are shown in table 20. The students from the DME are the ones who consider the role of the stakeholders as a crucial one (%85). They are followed by the students from DA (72%) and then from DCE (%68). The least recognition to the stakeholders comes from the students of DEE and DIA.

12. From the list below, please indicate all the stakeholders/professions you believe should cooperate to achieve a sustainable (built) environment.

☐ Architects

☐ Interior Architects

☐ Civil Engineers

☐ Mechanical Engineers

☐ Electrical Engineers

☐ Other

Table 21. Question 12 results for all Departments

	Architects		CEngineers		EEngineers		Interior Architects		Mengineers		other
Arch (25)	23	**92%**	11	44%	9	36%	7	**53.84%**	10	40%	-
Civil (19)	5	20%	19	**100%**	6	31.57%	3	23.07%	6	31.57%	Enviro. engineers
Electri(25)	7	28.00%	5	26.31%	19	**76%**	7	**53.84%**	6	24%	industrial
Interi(13)	2	15.38%	2	10.52%	2	15.38%	11	**84.61%**	2	15.38%	I. arch+programmer
Mecha(13)	3	23.07%	3	15.78%	2	15.38%	2	15.38%	12	**92.30%**	Chemists

Question 12 results are represented in the above table. The majority of students select their own specialty as the most important stakeholders/professions that should cooperate to achieve a sustainable (built) environment. They do not recognize collaboration as an important factor for achieving sustainability. The only two departments, which have students closer to cooperation are DA and DEE. Students from the DCE, indicate a need for collaboration with environmental engineers and even though do not point out to any specific other profession as a team member, have a more even distribution of choices.

13. Which of the following is a renewable resource?

☐ Oil ☐ Iron ore ☐ Trees ☐ Coal ☐ All of the above ☐ Do not know

Table 22. Question 13 results for all Departments

	Architecture 25		Civil 19		Electrical 25		İnterior 13		Mechanical 13	
Oil	0	% -	1	% 5.26%	6	% 24%	5	% **38.46%**	2	% 15.38%
Iron ore	4	16%	2	10.52%	1	4%	0	-	1	7.69%
Trees	10	**40%**	11	**57.89%**	7	28.00%	2	15.38%	5	**38.46%**
Coal	3	12%	1	5.26%	1	4%	1	7.69%	0	-
All of the above	3	12%	2	10.52%	3	12%	1	7.69%	4	**30.76%**
Do not know	5	20%	2	10.52%	7	**28.00%**	4	**30.76%**	1	7.69%

Regarding the renewable resources, according to Table 22 architecture and civil engineering students selected “trees”. This is also applicable in less extent to mechanical engineering students. Interior architecture students mostly believe that “oil” is a renewable resource.

14. "Sustainability" with regard to natural resources means:

□ Using natural resources as slowly as possible
□ Using only as much as is replaced by natural processes
□ Not introducing new technology too quickly
□ Discovering new resources to allow maximum economic growth
□ Do not know

Table 23. Question 14 results for all Departments

	Architecture 25		Civil 19		Electrical 25		İnterior 13		Mechanical 13	
Using natural resources as slowly as possible	4	% 16%	6	% 31.5%	9	% 36%	4	% 30.76%	1	% 7.69%
Using only as much as is replaced by natural processes	12	**48%**	6	31.5%	3	12%	4	30.76%	8	**61.53%**
Not introducing new technology too quickly	2	8%	3	15.7%	6	24%	2	15.38%	1	7.69%
Discovering new resources to allow maximum economic growth	4	16%	3	15.7%	4	16%	1	7.69%	2	15.38%
Do not know	3	12%	1	5.26%	3	12%	2	15.38%	1	7.69%

Table above shows the numerical results for Q14. The correct answer to this question was “Using as much as is replaced by natural processes. Students from the DME have the lead with 62%. They are followed by students from DA, with 48%. The least number of students, who ticked the correct option are from the DEE with %12.

15. Which of the following are `principles of systems thinking`?

□ It views the measured outcome within the larger, more complex system.

□ It addresses problems in a way that does not create new problems in the future.

□ It considers the impact of actions beyond environmental, economic and social to also include time and space.

□ It can be thought of as the three dimensional ripple effect of your actions where nearly everything is somehow interrelated and interconnected.

□ All of the above.

Table 24. Question 15 results for all Departments

	Architecture (25)		**Civil (19)**		**Electrical (25)**		**Interior (13)**		**Mechanical (13)**	
It views the measured outcome within the larger, more complex system	1	% 4%	0	% -	4	% 16%	1	% 7.69%	1	% 7.69%
It addresses problems in a way that does not create new problems in the future	3	12%	4	21.05%	3	12%	0	-	5	***38.46%***
It considers the impact of actions beyond environmental, economic and social to also include time and space	4	16%	7	***36.84%***	7	28.00%	8	**61.53%**	2	15.38%
It can be thought of as the three dimensional ripple effect of your actions where nearly everything is somehow interrelated and interconnected	3	12%	2	10.52%	2	8%	0	-	0	-
All of the above	**9**	**36%**	**3**	**15.78%**	**4**	**16%**	**2**	**15.38%**	**3**	**23.07%**
Do not know	5	**20%**	3	15.78%	5	**20%**	2	15.38%	2	15.38%

The best click to this question in relevance to sustainability awareness would be “All of the above”. This option was chosen mostly by the students from DA (%36) and all the rest have percentages around 15%-23%.

However, according to the table above, students of DIA assumed that system thinking considers the impact of actions beyond environmental, economic and social to also include time and space. It is also correct for students of DCE and DEE to a less extent..

In DME, students deem that principal of system thinking is supposed to address problems in a way that does not create new problems in the future.

16. Which resources would you find most beneficial to help you learn more about sustainability? (Please select all that apply)

□ Blogs
□ E-mail communication
□ In-person workshops / classes
□ Large educational events, such as themed fairs
□ On-campus signs
□ Online workshops / classes
□ Public forums
□ Social media (ex. Facebook, Twitter, etc.)
□ Websites

According to the results of Q16, which are presented in the table below, DA students select “in-person workshops/classes” and “large educational events” as the most advantageous options. DCE students choose “large educational events” as well as “on campus signs”. DEE students mostly believe in “blogs” and “email communications” as the beneficial ways. DIA students are mostly interested in “in-person workshops/classes” and “websites”. The ideas are quite different among the students in DME, however, they show a significant interest in learning through digital media.

Table 25. Question 16 results for all Departments

	Architecture 25		Civil 19		Electrical 25		Interior 13		Mechanical 13	
Blogs	4	% 16%	4	% 21.05%	9	% 36%	1	% 7.69%	3	% 23.07%
E-mail communication	5	20%	3	15.78%	11	**44%**	3	23.07%	3	23.07%
In-person workshops / classes	12	**48%**	5	26.31%	5	20%	6	**46.15%**	5	***38.46%***
Large educational events, such as themed fairs	11	**44%**	7	36.84%	6	24%	1	7.69%	4	30.78%
On-campus signs	6	24%	7	36.84%	8	32%	3	23.07%	4	30.78%
Online workshops / classes	4	16%	3	15.78%	5	20%	2	15.38%	4	30.78%
Public forums	9	36%	3	15.78%	5	20%	1	7.69%	4	30.78%
Social media (ex. Facebook, Twitter, etc.)	9	36%	5	26.31%	10	**40%**	3	23.07%	8	**61.53%**
Websites	9	36%	4	21.05%	8	32%	5	38.46%	7	**53.84%**

4.2 Numerical Calculation of the Level of Awareness

In order to be able reach the main aim of this thesis, it was important to follow a statistical analysis on survey data and hence be able to create a reasonable conclusion. Within the framework of this thesis, for further analysis, a simple "ranking" method was implemented. Answers to each question were ranked; in other words, given a coefficient of sustainability, with a value between 0-5. In question 13, negative values from -1till -4 were also allocated to the answers (For more details please refer to the Appendixes; Appendix 2).

After this, the answers with calculated coefficient values were formed into a matrix/table, which enabled clear comprehension of the results as related to an awareness level on sustainability. These matrices/tables are presented below, in an order that they were created. Firstly, a table which was created according to the "ranked" answers and percentages of students, who chose the relevant ranked answer is introduced, then the mathematically calculated cumulative table is presented. "max" and "min" of achievable value is 29 and 6 respectively.

In the following tables the Calculations related with sustainability awareness coefficients and percentages is shown:

4. Please indicate which of the following statements best describes your level of interest in sustainability:

Question 4	coefficient	percentage	coefficient	percentage	Rank
architecture	2	0,32	1	0,48	1,12
Civil	2	0,26	1	0,52	1,04
Electrical	2	0,48	1	0,2	1,16
Interior	2	0,23	1	0,53	0,99
Mechanical	2	0,23	1	0,61	1,07

5. Please rate your level of agreement with the following statements:

Question	5a	Environment			rank
Architecture	2	0,2	1	0,6	1
Civil	2	0,36	1	0,42	1,14
Electrical	2	0,36	1	0,44	1,16
İnterior	2	0,15	1	0,76	1,06
mechanical	2	0,15	1	0,96	1,26

Question	5b	sustain			rank
Architecture	2	0,24	1	0,44	0,92
Civil	2	0,21	1	0,47	0,89
Electrical	2	0,2	1	0,44	0,84
İnterior	2	0,23	1	0,46	0,92
mechanical	2	0	1	0,76	0,76

Question	5c	daily			Rank
Architecture	4	0,16	3	0,44	1,96
Civil	4	0,15	3	0,47	2,01
Electrical	4	0,12	3	0,52	2,04
İnterior	4	0,7	3	0,53	4,39
mechanical	4	0,7	3	0,96	5,68

Question	5d	value			rank
Architecture	4	0,12	3	0,36	1,56
Civil	4	0,1	3	0,31	1,33
Electrical	4	0,32	3	0,36	2,36
İnterior	4	0,23	3	0,46	2,3
mechanical	4	0,15	3	0,61	2,43

Question	5e	think			Rank
Architecture	4	0,8	3	0,4	4,4
Civil	4	0,1	3	0,31	1,33
Electrical	4	0,32	3	0,2	1,88
İnterior	4	0,7	3	0,38	3,94
mechanical	4	0,23	3	0,53	2,51

Question	5f	would			rank
Architecture	3	0,12	2	0,6	1,56
Civil	3	0	2	0,31	0,62
Electrical	3	0,16	2	0,32	1,12
İnterior	3	0,15	2	0,46	1,37
mechanical	3	0,23	2	0,69	2,07

6. Please indicate the degree of importance you place on the following personal sustainability issues:

Question	6a	recycle			Rank
Architecture	3	0,44	2	0,44	2,2
Civil	3	0,42	2	0,47	2,2
Electrical	3	0,28	2	0,4	1,64
İnterior	3	0,23	2	0,53	1,75
mechanical	3	0,23	2	0,61	1,91

Question	6b	waste			rank
Architecture	4	0,36	3	0,36	2,52
Civil	4	0,31	3	0,36	2,32
Electrical	4	0,24	3	0,2	1,56
İnterior	4	0,3	3	0,3	2,1
mechanical	4	0,61	3	0,15	2,89

Question	6c	food			Rank
Architecture	3	0,4	2	0,28	1,76
Civil	3	0,26	2	0,31	1,4
Electrical	3	0,24	2	0,28	1,28
İnterior	3	0,15	2	0,46	1,37
mechanical	3	0,61	2	0,3	2,43

Question	6d	water			rank
Architecture	4	0,4	3	0,44	2,92
Civil	4	0,52	3	0,42	3,34
Electrical	4	0,28	3	0,36	2,2
İnterior	4	0,3	3	0,3	2,1
mechanical	4	0,38	3	0,53	3,11

Question	6e	purchase			Rank
Architecture	3	0,24	2	0,52	1,76
Civil	3	0,31	2	0,36	1,65
Electrical	3	0,28	2	0,24	1,32
İnterior	3	0,3	2	0,53	1,96
mechanical	3	0,53	2	0,15	1,89

Question	6f	energy			rank
Architecture	4	0,52	3	0,24	2,8
Civil	4	0,36	3	0,36	2,52
Electrical	4	0,2	3	0,48	2,24
İnterior	4	0,23	3	0,46	2,3
mechanical	4	0,46	3	0,53	3,43

Question	6g	carbon			rank

Architecture	3	0,44	2	0,2	1,72
Civil	3	0,47	2	0,26	1,93
Electrical	3	0,24	2	0,28	1,28
İnterior	3	0	2	0,3	0,6
mechanical	3	0,53	2	0,15	1,89

9. Of the following sustainability related terms, programs or practices please mark the ones that you already knew before taking this survey. (Please select all that apply).

Question	9a	energy	rank	Question	9b	ecologic	rank
Architecture	4	0,56	2,24	Architecture	4	0,68	2,72
Civil	4	0,68	2,72	Civil	4	0,15	0,6
Electrical	4	0,4	1,6	Electrical	4	0,24	0,96
İnterior	4	0,46	1,84	İnterior	4	0,23	0,92
mechanical	4	0,84	3,36	mechanical	4	0,23	0,92
Question	**9c**	**envirom**	**rank**	**Question**	**9d**	**biodi**	**rank**
Architecture	2	0,52	1,04	Architecture	3	0,16	0,48
Civil	2	0,52	1,04	Civil	3	0,21	0,63
Electrical	2	0,16	0,32	Electrical	3	0,12	0,36
İnterior	2	0,46	0,92	İnterior	3	0,23	0,69
mechanical	2	0,46	0,92	mechanical	3	0,15	0,45
Question	**9e**	**integ**	**rank**	**Question**	**9f**	**sick**	**rank**
Architecture	4	0,28	1,12	Architecture	3	0,2	0,6
Civil	4	0,5	2	Civil	3	0,1	0,3
Electrical	4	0,2	0,8	Electrical	3	0,2	0,6
İnterior	4	0,7	2,8	İnterior	3	0,15	0,45
mechanical	4	0,15	0,6	mechanical	3	0,23	0,69
Question	**9g**	**indoor**	**rank**	**Question**	**9h**	**waste**	**rank**
Architecture	2	0,56	1,12	Architecture	4	0,36	1,44
Civil	2	0,26	0,52	Civil	4	0,57	2,28
Electrical	2	0,64	1,28	Electrical	4	0,24	0,96
İnterior	2	0,38	0,76	İnterior	4	0,15	0,6
mechanical	2	0,3	0,6	mechanical	4	0,3	1,2
Question	**9i**	**LEED**	**rank**	**Question**	**9j**	**green**	**rank**
Architecture	4	0,2	0,8	Architecture	3	0,64	1,92
Civil	4	0,5	2	Civil	3	0,42	1,26
Electrical	4	0,8	3,2	Electrical	3	0,28	0,84
İnterior	4	0,7	2,8	İnterior	3	0,38	1,14

mechanical	4	0,7	2,8	mechanical	3	0,46	1,38

Question	9k	life	rank	Question	9l	human	rank
Architecture	4	0,28	1,12	Architecture	2	0,68	1,36
Civil	4	0,15	0,6	Civil	2	0,15	0,3
Electrical	4	0,2	0,8	Electrical	2	0,2	0,4
İnterior	4	0,15	0,6	İnterior	2	0,2	0,4
mechanical	4	0,7	2,8	mechanical	2	0,53	1,06

1. **What do you think is the most important issue in the `design equation`?**

Question	10	envirom	rank
Architecture	4	0,36	1,44
Civil	4	0,42	1,68
Electrical	4	0,28	1,12
İnterior	4	0,38	1,52
mechanical	4	0,38	1,52

2. **Please rate the importance of the stakeholders involved in the construction industry in relevance to sustainability of the built environment.**

Question	11a	very important	rank	Question	11b	important	rank
Architecture	3	0,8	2,4	Architecture	2	0,64	1,28
Civil	3	0,1	0,3	Civil	2	0,57	1,14
Electrical	3	0,8	2,4	Electrical	2	0,48	0,96
İnterior	3	0,7	2,1	İnterior	2	0,53	1,06
mechanical	3	0,7	2,1	mechanical	2	0,76	1,52

13. Which of the following is a renewable resource?

Question	13a	oil	Rank
Architecture	-3	0	0
Civil	-3	0,5	-1,5
Electrical	-3	0,24	-0,72
İnterior	-3	0,38	-1,14
mechanical	-3	0,15	-0,45

Question	13b	iron	rank
Architecture	-2	0,16	-0,32
Civil	-2	0,1	-0,2
Electrical	-2	0,4	-0,8
İnterior	-2	0	0
mechanical	-2	0,7	-1,4

Question	13c	tree	Rank
Architecture	-1	0,4	-0,4
Civil	-1	0,57	-0,57
Electrical	-1	0,28	-0,28
Interior	-1	0,15	-0,15
Mechanical	-1	0,38	-0,38

Question	13d	coal	rank
Architecture	-3	0,12	-0,36
Civil	-3	0,5	-1,5
Electrical	-3	0,4	-1,2
Interior	-3	0,7	-2,1
Mechanical	-3	0	0

Question	13e	all	rank
Architecture	-4	0,12	-0,48
Civil	-4	0,1	-0,4
Electrical	-4	0,12	-0,48
Interior	-4	0,7	-2,8
Mechanical	-4	0,3	-1,2

14. "Sustainability" with regard to natural resources means:

Question	14	Replace	Rank
Architecture	5	0,48	2,4
Civil	5	0,31	1,55
Electrical	5	0,12	0,6
Interior	5	0,3	1,5
mechanical	5	0,61	3,05

7. Which of the following are `principles of systems thinking`?

Question	15a	views	rank
Architecture	1	0,4	0,4
Civil	1	0	0
Electrical	1	0,16	0,16
İnterior	1	0,7	0,7
mechanical	1	0,7	0,7

Question	15b	addresses	Rank
Architecture	1	0,12	0,12
Civil	1	0,21	0,21
Electrical	1	0,12	0,12
İnterior	1	0	0
mechanical	1	0,38	0,38

Question	15c	considers	rank
Architecture	1	0,16	0,16
Civil	1	0,38	0,38
Electrical	1	0,28	0,28
İnterior	1	0,61	0,61
mechanical	1	0,15	0,15

Question	15d	dimension	Rank
Architecture	1	0,12	0,12
Civil	1	0,1	0,1
Electrical	1	0,8	0,8
İnterior	1	0	0
mechanical	1	0	0

Question	15e	all	Rank
Architecture	4	0,36	1,44
Civil	4	0,15	0,6
Electrical	4	0,16	0,64
İnterior	4	0,15	0,6
mechanical	4	0,23	0,92

Total rank:

Question	Architecture	Civil	Electrical	Interior	Mechanical
Q4	1,12	1,12	1,16	0,99	1,07
Q5a	1	1,14	1,16	1,06	1,26
Q5b	0,92	0,89	0,84	0,92	0,76
Q5c	1,96	2,01	2.04	4,39	5,68
Q5d	1,56	1,33	2,36	2,3	2,43
Q5e	4,4	1,33	1,88	3,94	2,51
Q5f	1,56	0,62	1,12	1,37	2,07
Q6a	2,2	2,2	1,64	1,75	1,91
Q6b	2,52	2,32	1,56	2,1	2,89
Q6c	1,76	1,4	1,28	1,37	2,43
Q6d	2,92	3,34	2,2	2,1	3,11
Q6e	1,76	1,65	1,32	1,96	1,89
Q6f	2,8	2,52	2,24	2,3	3,43
Q6g	1,72	1,93	1,28	0,6	1,89

Q9a	2,24	2,72	1,6	1,84	3,36
Q9b	2,72	0,6	0,96	0,92	0,92
Q9c	1,04	1,04	0,32	0,92	0,92
Q9d	0,48	0,83	0,36	0,69	0,45
Q9e	1,12	2	0,8	2,8	0,6
Q9f	0,6	0,3	0,6	0,45	0,69
Q9g	1,12	0,52	1,28	0,76	0,6
Q9h	1,44	2,28	0,96	0,6	1,2
Q9I	0,8	2	3,2	2,8	2,8
Q9j	1,92	1,26	0,84	1,14	1,38
Q9k	1,12	0,6	0,8	0,6	2,8
Q9l	1,36	0,3	0,4	0,4	1,06
Q10	1,44	1,68	1,12	1,52	1,52
Q11a	2,4	0,3	2,4	2,1	2,1
Q11b	1,28	1,14	0,96	1,06	1,52
Q13a	0	-1,5	-0,72	-1,14	-0,45
Q13b	-0,32	-0,2	-0,8	0	-1,4
Q13c	-0,4	-0,57	-0,28	-0,15	-0,38
Q13d	-0,36	-1,5	-1,2	-2,1	0
Q13e	-0,48	-0,4	-0,48	-2,8	-1,2
Q14	2,4	1,55	0,6	1,5	3,05
Q15a	0,4	0	0,16	0,7	0,7
Q15b	0,12	0,21	0,12	0	0,38
Q15c	0,16	0,38	0,28	0,61	0,15
Q15d	0,12	0,1	0,8	0	0
Q15e	1,44	0,6	0,64	0,6	0,92
results	52,36	39,84	37,8	42,97	57,02

The results indicate that the department which has graduating students with highest level of awareness regarding sustainability is the DME, with 57 points. The second one is DA, with 52 points and the third department is the DIA with 43 points. DCE follows with 40 points and DEE have the least points with 38.

4.3 Results Regarding the Necessity for Collaboration

Questions 10, 11 and 12 were related to the ethical dimensions of the daily practices any stakeholder, who is involved in the design and realization of a built environment. Question number 10 asked about the most important issue in the "design equation".

	Architecture 25		Civil 19		Electrical 25		İnterior 13		Mechanical 13	
Environment		%		%		%		%		%
	9	36%	8	42.10%	7	28.00%	5	38.46%	5	38.46%
Cost	7	28.00%	13	**68.42%**	7	28.00%	1	**7.69%**	4	30.76%
Performance	15	**60%**	5	26.31%	11	44%	3	23.7%	8	**61.53%**
Aesthetics	3	12%	3	15.78%	2	**8%**	6	**46.15%**	2	15.38%
Other	Ergonomic		Noise pollution		-	-	-	-	comfort	

It would be expected that, graduating students with a high level of awareness on sustainability, would put "environment" as a first choice. However, as can be reminded from the table above, this was not the case. "Performance", being the most important one for the students, was followed by the cost and then the "environment". This is a very serious conclusion.

Following question 10 (ethical responsibility), as another responsibility question; Q 11, was included in the survey, in order to see the awareness level of students about understanding that role they will play as graduates. The question was asking the students to "rate the importance of the stakeholders". Most students (more than 50%) rated the importance of the stakeholders as either very important or important.

These above mentioned two questions, created the basis for one of the most crucial questions of the whole survey - and that was related to measuring the awareness level of the students towards an understanding that "sustainability" is about "teamworkcollaboration". Question 12, asked them to indicate the professions, they believed, should cooperate in order to achieve a sustainable built environment. The results were very unexpected. Even though in real life, in their summer practices, these students must have experienced that, almost all of the mentioned professions do need to cooperate, the students who recognized the need for collaboration were a minority.

	Architects		CEngineers		Eengineers		Interior Architects		MEngineers		Other
Arch (25)	23	**92%**	11	44%	9	36%	7	**53.84%**	10	40%	-
Civil (19)	5	20%	19	**100%**	6	31.57%	3	23.07%	6	31.57%	Enviro. engineers
Electri(25)	7	28.00%	5	26.31%	19	**76%**	7	**53.84%**	6	24%	industrial
Interi(13)	2	15.38%	2	10.52%	2	15.38%	11	**84.61%**	2	15.38%	I. arch+programmer
Mecha(13)	3	23.07%	3	15.78%	2	15.38%	2	15.38%	12	**92.30%**	Chemists

The results, which are re-presented above for the purpose of remembering, indicate that the students see their professions as a solo central agent. The students approach to cooperation is very clearly very negative.

4.4 Discussion of the Findings

As an overall summary and brief introduction to a discussion, the following points can be put forward:

- All departments (DA, DCE, DEE, DIA and DME) have a contribution to the education of a young population, which has age limits from 20-30. This is an age range, which is extremely important. These young people can graduate either as active agents for progress towards a sustainable built environment or as passive consumers.
- Most of the graduating students from the five departments are from Turkey and Iran (in total something around 50%). This is an indication towards a very sensitive point: The latest statistics related to Turkey are all around the construction industry. The country's economic expansion is mainly based on

this industry. Iran, having many big cities, where high quality buildings are in demand is not a very much different case.

- EMU as related to departments related to build environment professionals, is mostly preferred in two departments – these are Architecture and Electrical Engineering. It could be an issue of consideration, to understand the reasons underlying the preference of these two departments.
- Even though the students claim to have considerable interest in issues related sustainability, they show much less interest in learning about sustainability. This is an interesting contradiction/controversy.
- In question 6, amongst personal issues related to sustainability, students know most about “recycling” and “energy conservation”. “Water conservation” also shows up as an important matter, however, later, in question 9, when asked about sustainability related terms, programs or practices “water management” is at a much lower rank on the results. Considering the problems Cyprus is experiencing around “water”, the related departments in EMU have a serious issued to consider further.
- As related to EMU campus-related awareness on sustainability; the results indicate an untapped domain for EMU managers.
- Results to questions 10, 11, 12 indicate that, at a departmental level, and between the five departments, there is a need for further discussion related to the ethical responsibilities of the professions involved; as well as the need for more deliberate cooperation.
- Results to questions 13, 14 and 15; which were aimed at testing the theoretical knowledge/awareness related to sustainability, revealed the lowest ranks. Students have little knowledge about the meanings of “renewable sources”,

definition of “sustainability with regard to natural resources” and “principles of systems thinking”.

- The answers to the last question, about which resources the students would find most beneficial to help them learn more about sustainability; indicate a low interest in learning through in-person workshops or classes. Student answers yield a bigger interest in learning through social media and websites.

In overall, the results show that the students are interested and feel passionate towards sustainability and environmental issues. However, as a contradiction, they do not want to learn about it with the same intensity/passion. So on one side, it is good to know that, the students have a general interest in the topic, on the other side it is an issue, why they know so little. To shed some light on this issue, the curriculums of the five departments which were downloaded from their web-pages and studies were re-studied. For this purpose, the curriculums and course descriptions were reviewed for each department separately. Then after, the courses which were seemingly related to sustainability in any extent were marked. These courses are listed in the table below.

Table 26. Sustainability related courses

Department	Sustainability related courses	Course code
Architecture	Architectural constriction and materials 1,2,3	ARCH243, 244, 347
	Energy and environmental issues in design	ARCH246
	Building and environmental systems in architecture	ARCH348
Civil engineering	Architecture for engineering	ARCH396
	Materials of construction	CIVL284
Electrical engineering	Fundamentals of Thermodynamics	MENG244
	Material science	MENG286
	Fundamentals of engineering economy	MENG420
Interior architecture	Construction & materials for interior	INAR246
	Color & lighting for interiors	INAR207
	Integrated building systems	INAR347
Mechanical engineering	-	-

Considering both the courses and the results, there is no direct relationship between the level of awareness and the knowledge on sustainability and the number of courses. It confirms that the effectiveness of education in that area is not only about the number of courses. To some extent, mechanical engineers, architectures and interior architects are the most aware students in the field of sustainability.

Chapter 5

CONCLUSION

In this study, the awareness of graduating students of five departments of Eastern Mediterranean University (EMU) which are involved in building a sustainable construct, namely Interior Design, Architecture, Civil Engineering, Mechanical Engineering and Electrical Engineering is investigated.

A survey; questionnaire was designed; distributed among graduating bachelor students of the related departments, collected the results and these were analyzed. The questionnaires are designed to measure the awareness level of students in five different departments of EMU. Using M.S. Excel and bar graphs and tables, the results were summarized and described. The total number of 9 questions which are questioning the sustainability awareness were asked from the subjects, each of this questions carry zero to five points for awareness. The total collectable point (on percentage base) was around a hundred. The maximum score is 57% by Mechanical engineering students, while the least score belongs to electrical engineering department with only 37%.

Our findings show that although most of the students are passionate about sustainability concepts, considering the main goal, i.e. the level of awareness, the survey results are not satisfying as most of the students, don’t have deep enough knowledge about sustainability and implementation methods of it, particularly when it comes to implementing the related concept of sustainability within their own profession and field of study.

To be more distinct about this issue it should be considered in which ways and by which aspects a certain profession must contribute to the concept of sustainability. It defiantly requires a deep knowledge of the sustainability concept itself as well as experience. Since the study scheme a university, and since sustainability one the most important contemporary requirements of our planet, it is on university to put more effort and investment to provide a powerful infrastructure to teach and empower the students related with the built environment and make sure that the transmitted knowledge has a real life application and will not remain at a theoretical level.

Considering the program curriculum, it was observed that although the role of basic sciences such as mathematics and physics is taken serious enough in all of the programs, there is almost no course directly related to sustainability. In the world of today in which new sciences are introduced it is not enough to teach the student with the basic knowledge and hope they will find how they can apply their knowledge interdisciplinary. Obviously, managing the science, optimizing the knowledge area and cross functional usage of them, is a very important issue in our modern world. Sustainability is an issue in which needs too much interdisciplinary collaboration, deep information on professional level and requires a good directorial skill if it is to be applied. Considering all mentioned above, it is concluded that EMU education system is not quite successful in teaching sustainability and environmental issues and therefore it is suggested that the curriculum of these programs which are directly involved in building a sustainable construct should be revised focusing more on sustainability higher education. Also adding real life practices in the educational curriculum is quite beneficial. Defining cross functional project between the departments, organizing workshop, conferences and investing on exchange programs with the other institute which have leading role about this concepts can be another part of the solutions.

This study is conducted on a limited number of student and only in one university, however performing such investigation on larger scale and in more number of universities can provide a better measure of total awareness of the graduating students who are entering the real life and based on that result, discussing the improvement chances and strategy, requirements and methods can be studied.

Overcoming the obstacles in implementation of sustainability concepts, optimizing the methods and strategies, new requirements and standards and introducing more convenient method which are easier to be understood and implemented are the other areas for further studies. Also the investigations may not be limited to only 5 departments.

Finding out which sections may have positive contribution on sustainability concept implementation is another further study criteria as well as comparing the life satisfaction between the countries who have had successful implementation sustainability concepts in building constructions and those who have not implemented them yet and finding the useful lesson of their experience to be used.

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APPENDICES

Appendix 1: The Questionnaire

Eastern Mediterranean University

Faculty of Architecture Department of interior Architecture

This survey is being conducted as a part of a master thesis study to assess graduating students' sustainability knowledge, sustainable practices, attitudes about sustainability topics, and awareness. This survey is entirely voluntary and your identity will remain anonymous. Any feedback you provide will be kept confidential and only summarized results will be included in the written report of the thesis.

We hope you will give all of the questions your full consideration. The survey should take no more than 10-15 minutes to complete. Please answer each question to the best of your ability.

Thank you in advance,

Mahrokh Pooyanmehr

Graduate Student (Eastern Mediterranean University)

……………………………………………………………………………………………

1. **Please indicate your age:**

   ☐20 – 30 ☐30-40 ☐Over 40

2. **Please indicate your Nationality** ………………

3. **Please indicate your department at EMU:**

   ☐Architecture ☐Civil Engineering ☐Electrical Engineering

   ☐Interior Architecture ☐Mechanical Engineering

4. **Please indicate which of the following statements best describes your level of interest**

in sustainability:

☐I have a passion for sustainability

☐I have considerable interest in sustainability

☐I am neither interested nor disinterested in sustainability (neutral)

☐I have little interest in sustainability

☐I have no interest in sustainability

5. **Please rate your level of agreement with the following statements:**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
I make an effort to be knowledgeable about environmental issues	☐	☐	☐	☐	☐
I make an effort to be knowledgeable about sustainability issues	☐	☐	☐	☐	☐
My daily behavior reflects a concern about sustainability issues	☐	☐	☐	☐	☐
I value knowing that my food is grown locally	☐	☐	☐	☐	☐
I think about how and where my clothes are made	☐	☐	☐	☐	☐
I would like to learn more about sustainability while in University	☐	☐	☐	☐	☐

6. **Please indicate the degree of importance you place on the following personal sustainability issues:**

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree
Recycling	☐	☐	☐	☐	☐
Minimization of waste being sent to the landfill	☐	☐	☐	☐	☐
Choosing food based on its environmental impact	☐	☐	☐	☐	☐
Water conservation	☐	☐	☐	☐	☐
Purchasing environmentally friendly products	☐	☐	☐	☐	☐
Energy conservation	☐	☐	☐	☐	☐
Minimizing carbon emissions from transportation	☐	☐	☐	☐	☐

7. **Are you aware of any sustainability initiatives at EMU?**

☐Yes ☐No

8. **If yes, please indicate on which of the following issues**

☐ Recycling minimization of waste being sent to the landfill

☐ Choosing food based on its environmental impact

☐ Water conservation

☐ Purchasing environmentally friendly products

☐ Energy conservation

☐ Minimizing carbon emissions from transportation

☐ Other…………….

9. **Of the following sustainability related terms, programs or practices please mark the ones that you already knew before taking this survey. (Please select all that apply).**

☐ Energy & climate change ☐ Integrated management of water ☐ LEED

☐ Ecological choice &material ☐ Sick building syndrome ☐ Green design

☐ Environmental quality ☐Indoor air quality ☐Life cycle design

☐ Biodiversity ☐Waste management ☐ Human comfort

10. **What do you think is the most important issue in the `design equation`?**

□ Environment □ Cost □ Performance
□ Aesthetics □ Other…………….

11. **Please rate the importance of the stakeholders involved in the construction industry in relevance to sustainability of the built environment.**

☐ Very Important ☐ Important ☐ Neutral ☐ Unimportant ☐Very Unimportant

12. **From the list below, please indicate all the stakeholders/professions you believe should cooperate to achieve a sustainable (built) environment.**

☐ Architects ☐ Interior Architects ☐ Civil Engineers

☐ Mechanical Engineers ☐ Electrical Engineers ☐ Other…………….

13. **Which of the following is a renewable resource?**

☐ Oil

☐ Iron ore

☐ Trees

☐ Coal

☐ All of the above

☐ Do not know

14. **"Sustainability" with regard to natural resources means:**

☐ Using natural resources as slowly as possible

☐ Using only as much as is replaced by natural processes

☐ Not introducing new technology too quickly

☐ Discovering new resources to allow maximum economic growth

☐ Do not know

15. **Which of the following are `principles of systems thinking`?**

☐ It views the measured outcome within the larger, more complex system

☐ It addresses problems in a way that does not create new problems in the future

☐ It considers the impact of actions beyond environmental, economic and social to also include time and space

☐ It can be thought of as the three dimensional ripple effect of your actions where nearly everything is somehow interrelated and interconnected

☐ All of the above

☐ Do not know

16. Which resources would you find most beneficial to help you learn more about sustainability? (Please select all that apply)

☐ Blogs

☐ E-mail communication

☐ In-person workshops / classes

☐ Large educational events, such as themed fairs

☐ On-campus signs

☐ Online workshops / classes

☐ Public forums

☐ Social media (ex. Facebook, Twitter, etc.)

☐ Websites

Appendix 2: Questionnaire with "the points" (ranking)

According the most important aim in this topic is about aware of sustainability, in this part you can see the point (0-5) of every question what it has a more relation with this research.

4. Please indicate which of the following statements best describes your level of interest in sustainability:

Answer	Points
I have a passion for sustainability	2
I have considerable interest in sustainability	1
I am neither interested nor disinterested in sustainability (neutral)	-
I have little interest in sustainability	-
I have no interest in sustainability	-
No answer	-

5. Please rate your level of agreement with the following statements:

	Points Strongly agree	Points Agree
I make an effort to be knowledgeable about environmental issues	2	1
I make an effort to be knowledgeable about sustainability issues	2	1
My daily behavior reflects a concern about sustainability issues	4	3
I value knowing that my food is grown locally	4	3
I think about how and where my clothes are made	4	3
I would like to learn more about sustainability while in University	3	2

6: Please indicate the degree of importance you place on the following personal sustainability issues:

	Points Very Important	Points Important
Recycle	3	2
Minimization of waste being sent to the landfill	4	3
Choosing food based on its environmental impact	3	2
Water conservation	4	3
Purchasing environmentally friendly products	3	2
Energy conservation	4	3
Minimizing carbon emissions from transportation	3	2

9: Of the following sustainability related terms, programs or practices please mark the ones that you already knew before taking this survey. (Please select all that apply).

	Points
Energy & climate change	4
Ecological choice &material	4
Environmental quality	2
Biodiversity	3
Integrated management of water	4
Sick building syndrome	3
Indoor air quality	2
Waste management	4
LEED	4
Green design	3
Life cycle design	4
Human comfort	2

10: What do you think is the most important issue in the `design equation`?

	Points
Enviroment	4
Cost	-
Performance	-
Aesthetics	-
Other	-

11: Please rate the importance of the stakeholders involved in the construction industry in relevance to sustainability of the built environment.

	Points
Very important	3
Important	2
Neutral	-
Unimportant	-
Very Unimportant	-

13: Which of the following is a renewable resource?

	Points
Oil	(-3)
İron ore	(-2)
Trees	(-1)
Coal	(-3)
All of the above	(-4)
Do not know	-

14: "Sustainability" with regard to natural resources means:

	Points
Using natural resources as slowly as possible	-
Using only as much as is replaced by natural processes	5
Not introducing new technology too quickly	-
Discovering new resources to allow maximum economic growth	-
Do not know	-

15: Which of the following are `principles of systems thinking`?

	points
It views the measured outcome within the larger, more complex system	1
It addresses problems in a way that does not create new problems in the future	1
It considers the impact of actions beyond environmental, economic and social to also include time and space	1
It can be thought of as the three dimensional ripple effect of your actions where nearly everything is somehow interrelated and interconnected	1
All of the above	4
Do not know	-

Appendix 3: Curriculums of Architecture, Civil Engineering, Electrical Engineering, Interior Architecture and Mechanical Engineering

EMU Full Curriculum Of Department Architecture

Full Curriculum
UC = University Core; FC = Faculty Core; AC = Area Core; AE = Area Elective; FE= Free Elective, UE = University Elective

Semester	Ref Code	Course Code	Full Course Title	Course Category	Credit				Prerequisites	ECTS credits
					Lec	Lab	Tut	Tot		
1	71711	FARC101	BASIC DESIGN STUDIO	FC	4	0	4	6		10
1	71712	FARC103	GRAPHIC COMMUNICATION -I	FC	2	0	2	3		5
1	71713	FARC113	INTRODUCTION TO DESIGN	FC	3	0	0	3		3
1	71714	ENGL191	COMMUNICATION IN ENGLISH-I	UC	3	0	1	3		6
1	71715	MATH191	MATHS AND GEOMETRY FOR DESIGNERS	FC	3	0	0	3		3
1	71716	TUSL181/ HIST280	ATATÜRK'S PRINCIPLES AND HISTORY OF TURKISH REFORMS/ TURKISH AS A SECOND LANGUAGE	UC	2	0	0	2		2
1								20		
2	71721	FARC102	INTRODUCTORY DESIGN STUDIO	FC	4	0	4	6	FARC101	10
2	71722	FARC104	GRAPHIC COMMUNICATION- II	FC	2	0	2	3	FARC103	5
2	71723	FARC142	INTRODUCTION TO DESIGN TECHNOLOGY	FC	2	0	2	3		3
2	71724	ENGL192	COMMUNICATION IN ENGLISH- II	UC	3	0	1	3		6
2	71725	ITEC105	COMPUTER-I	UC	2	0	2	3		3
2	71726	ARCH114	HUMAN AND SOCIO- CULTURAL FACTORS IN DESIGN	AC	3	0	0	3		3
2	71727	ARCH190	SUMMER PRACTICE -I	AC	0	0	0	0		3
2								21		
3	71731	ARCH291	ARCHITECTURAL DESIGN STUDIO-I	AC	4	0	4	6	FARC102 FARC103	12
3	71732	ARCH213	ECOLOGICAL ISSUES IN ARCHITECTURE	AC	3	0	0	3		3
3	71733	ARCH225	HISTORY AND THEORIES OF ARCHITECTURE- I	AC	3	0	0	3		3
3	71734	ARCH235	INTRODUCTION TO TECTONICS OF STRUCTURAL SYSTEMS	AC	3	0	1	3		3
3	71735	ARCH243	ARCHITECTURAL CONSTRUCTION AND MATERIALS -I	AC	2	0	2	3		4
3	71736	ARCH281	COMPUTER AIDED DESIGN	AC	2	0	2	3		5
3								21		
4	71741	ARCH292	ARCHITECTURAL DESIGN STUDIO- II	AC	4	0	4	6	ARCH291 FARC104	12
4	71742	ARCH226	HISTORY AND THEORIES OF ARCHITECTURE -II	AC	3	0	0	3		3
4	71743	ARCH236	TECTONICS OF FLEXURAL STRUCTURES	AC	3	0	1	3	ARCH235	3
4	71744	ARCH244	ARCHITECTURAL CONSTRUCTION AND MATERIALS- II	AC	2	0	2	3	ARCH243	4
4	71745	ARCH246	ENERGY AND ENVIRONMENTAL ISSUES IN DESIGN	AC	3	0	0	3		4

4	71756	ARCH252	THEORY OF URBAN DESIGN	AC	3	0	0	3		4
4	71747	ARCH290	SUMMER PRACTICE- II	AC	0	0	0	0	ARCH190	3
4								21		
5	71751	ARCH391	ARCHITECTURAL DESIGN STUDIO- III	AC	4	0	4	6	ARCH292	14
5	71752	ARCH311	PRINCIPLES OF CONSERVATION AND RESTORATION	AC	3	0	0	3		3
5	71753	ARCH337	TECTONICS OF FORM RESISTANT STRUCTURES	AC	3	0	1	3		3
5	71754	ARCH347	ARCHITECTURAL CONSTRUCTION AND MATERIALS -III	AC	2	0	2	3		4
5	71755	ARCH353	PROCESS OF URBAN DESIGN	AC	2	0	2	3		4
5	71756	ARCH381	DIGITAL COMMUNICATION IN ARCHITECTURE	AC	2	0	2	3	ARCH 281	5
5								21		
6	71761	ARCH392	ARCHITECTURAL DESIGN STUDIO- IV	AC	4	0	4	6	ARCH391	14
6	71762	ARCH312	ARCHITECTURE AND DESIGN THEORIES	AC	3	0	0	3		4
6	71763	AE01	AREA ELECTIVE- I	AE	3	0	0	3		3
6	71764	ARCH342	WORKING DRAWING	AC	2	0	2	3	ARCH244	4
6	71765	ARCH348	BUILDING AND ENVIRONMENTAL SYSTEMS IN ARCHITECTURE	AC	2	0	2	3		4
6	71766	AE02	AREA ELECTIVE- II	AE	3	0	0	3		3
6	71767	ARCH390	SUMMER PRACTICE -III	AC	0	0	0	0	ARCH190	3
6								21		
7	71771	ARCH491	ARCHITECTURAL DESIGN STUDIO -V	AC	4	0	4	6	ARCH392 FARC111 FARC142 ARCH114 ARCH213 ARCH281 ARCH226 ARCH236 ARCH244 ARCH246 ARCH252	14
7	71772	ARCH449	ECONOMIC AND MANAGERIAL ISSUES IN ARCHITECTURE	AC	3	0	0	3		4
7	71773	AE03	AREA ELECTIVE -III	AE	3	0	0	3		3
7	71774	AE04	AREA ELECTIVE - IV	AE	3	0	0	3		3
7	71775	UE01	UNIVERSITY ELECTIVE- I	UE	3	0	0	3		3
7								18		
8	71781	ARCH492	ARCHITECTURE GRADUATION PROJECT	AC	4	0	4	6	ARCH491	20
8	71782	ARCH412	PROFESSIONAL ISSUES IN ARCHITECTURE	AC	3	0	0	3		4
8	71783	AE05	AREA ELECTIVE - V	AE	3	0	0	3		3
8	71784	UE02	UNIVERSITY ELECTIVE- II	UE	3	0	0	3		3
8								15		

http://ww1.emu.edu.tr/en/programs/architecture-undergraduate-program/c/880?tab=curriculum

EMU full curriculum of Department Civil Engineering

	REF. NO	COURSE CODE	COURSE NAME	CREDIT HOURS	PRE-REQUISITE(S)	
1	22711	CIVL100	INTRODUCTION TO CIVIL ENGINEERING	(0,1) 0		5
	22712	CIVL103	CIVIL ENGINEERING DRAWING	(2,3) 3		
	22713	CHEM101	GENERAL CHEMISTRY	(4,1) 4		
	22714	ENGL191	COMMUNICATION IN ENGLISH-I	(3,1) 3		
	22715	MATH151	CALCULUS-I	(4,1) 4		
	22716	UE - 01	UNIVERSITY ELECTIVE - 1 (CULTURE)	(3,0) 3		
			(TERM)/(CUMULATIVE) CREDITS=	(17)/(17)		
2	22721	CMPE108	ALGORITHS AND PROGRAMMING	(2,3) 3		5 + 1
	22722	ENGL192	COMMUNICATION IN ENGLISH-II	(3,1) 3	22714 ENGL191	
	22723	MATH152	CALCULUS-II	(4,1) 4	22715 MATH151	
	22724	PHYS101	PHYSICS-I	(4,1) 4		
	22725	UE - 02	UNIVERSITY ELECTIVE - 2 (ENVIRONMENT)	(3,0) 3		
	22726	HIST280/TUSL181	HIST. TURK. REF./TURK. AS A SECOND LANG.	(2,0) 2		
			(TERM)/(CUMULATIVE) CREDITS=	(19)/(36)		
3	22731	CIVL211	STATICS	(4,1) 4	22724 PHYS101	5
	22732	CIVL261	SURVEYING	(3,2) 4		
	22733	CIVL283	MATERIALS SCIENCE	(3,1) 3	22713 CHEM101	
	22734	MATH322	PROBABILITY AND STATISTICAL METHODS	(3,1) 3	22715 MATH151	
	22735	PHYS102	PHYSICS-II	(4,1) 4	22724 PHYS101	
			(TERM)/(CUMULATIVE) CREDITS=	(18)/(54)		
4	22741	CIVL222	STRENGTH OF MATERIALS	(4,1) 4	22731 CIVL211	5
	22742	CIVL284	MATERIALS OF CONSTRUCTION	(3,2) 4		
	22743	ENGL201	COMMUNICATION SKILLS	(3,0) 3	22722 ENGL192	
	22744	MENG233	RIGID BODY DYNAMICS	(4,1) 4	22731 CIVL211	
	22745	MATH241	LINEAR ALGEBRA AND ORD. DIFFERENTIAL EQUATIONS	(4,1) 4	22715 MATH151	
			(TERM)/(CUMULATIVE) CREDITS=	(19)/(73)		
5	22751	CIVL300	SUMMER PRACTICE	(0,0) 0	min. CUM.CRD.=73 / DC**	5
	22752	CIVL331	FLUID MECHANICS	(4,1) 4	22745 MATH241	
	22753	CIVL343	INTRODUCTION TO STRUCTURAL MECHANICS	(4,1) 4	22741 CIVL222	
	22754	CIVL353	EARTH SCIENCE	(4,1) 4	min.AT=4*	
	22755	CIVL361	TRANSPORTATION ENGINEERING	(4,1) 4	22732 CIVL261	
	22756	MATH373	NUMERICAL ANALYSIS FOR ENGINEERS	(3,1) 3	22744 MATH241	
			(TERM)/(CUMULATIVE) CREDITS=	(19)/(92)		
6	22761	CIVL332	HYDROMECHANICS	(4,1) 4	22752 CIVL331	5
	22762	CIVL344	STRUCTURAL ANALYSIS	(4,1) 4	22753 CIVL343	
	22763	CIVL354	SOIL MECHANICS	(4,1) 4	22754 CIVL353	
	22764	CIVL372	FUNDAMENTALS OF REINFORCED CONCRETE	(4,1) 4	22753 CIVL343	
	22765	CIVL394	CIVIL ENGINEERING CONSTRUCTION & ECONOMY	(3,1) 3	min.AT = 4*	
			(TERM)/(CUMULATIVE) CREDITS=	(19)/(111)		
7	22771	CIVL401	INTRODUCTION TO CAPSTONE PROJECT	(0,2) 1	min.AT = 6*	5
	22772	CIVL451	FOUNDATION ENGINEERING	(4,1) 4	22763 CIVL354	
	22773	CIVL471	DESIGN OF REINFORCED CONC. STRUCTURES	(4,1) 4	22762 CIVL344 & 22764 CIVL372	
	22774	CIVL473	FUNDAMENTALS OF STEEL DESIGN	(4,1) 4	22762 CIVL344	
	22775	CIVL493	CONSTRUCTION MANAGEMENT	(4,1) 4	22765 CIVL394	
	22776	UE - 03	UNIVERSITY ELECTIVE - 3	(3,0) 3		
			(TERM)/(CUMULATIVE) CREDITS=	(20)/(131)		
8	22781	CIVL402	CAPSTONE PROJECT	(2,3) 3	22771 CIVL401	5
	22782	AEL-01	AREA ELECTIVE - 1	(3,1) 3		
	22783	AEL-02	AREA ELECTIVE - 2	(3,1) 3		
	22784	AEL-03	AREA ELECTIVE - 3	(3,1) 3		
	22785	UE - 04	UNIVERSITY ELECTIVE - 4 (ETHICS)	(3,0) 3		
			(TERM)/(CUMULATIVE) CREDITS=	(15)/(146)		

[TOTAL 40 CREDIT COURSES + 1 (TURK/HIST) + 1 CREDITED (CIVL401) + 2 non-credit: CIVL100 & CIVL300]

http://civil.emu.edu.tr/index.php?option=com_content&view=article&id=6&Itemid=7

EMU full curriculum of Department Electrical Engineering

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
Semester 1					
EENG115	Introduction to Logic Design	1	4	4	1
CHEM101	General Chemistry	1	4	4	1
PHYS101	Physics - I	1	4	4	1
MATH151	Calculus - I	1	4	4	1
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
ENGL191	Communication in English - I	1	3	3	1
ENGL181	Academic English - I	1	3	5	1
Semester 2					
EENG112	Introduction to Programming	2	4	4	1
EENG102	Introduction to Electrical and Electronic Engineering	2	No-Credit	1	-
MATH106	Linear Algebra	2	3	3	1
MATH152	Calculus - II	2	4	4	1
PHYS102	Physics - II	2	4	4	1
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
ENGL192	Communication in English - II	2	3	3	-
ENGL182	Academic English - II	2	3	5	1
Semester 3					
EENG212	Algorithms and Data Structures	3	4	4	1
EENG223	Circuit Theory - I	3	4	4	1
MATH207	Differential Equations	3	4	4	1
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
MENG244	Fundamentals of Thermodynamics	3	3	3	-
CIVL211	Statics	3	4	4	-
MENG286	Material Science	3	3	3	1
MATH252	Mathematical Methods for Engineers	3	4	4	1
Semester 4					
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
HIST280	Atatürk`s Principles and History	4	2	2	-

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
	of Turkish Reforms				
TUSL181	Turkish as a Second Language	4	2	2	-
EENG245	Physical Electronics	4	4	4	1
EENG224	Circuit Theory - II	4	4	4	1
EENG226	Signals and Systems	4	4	4	-
EENG232	Electromagnetics - I	4	4	4	1
Semester 5					
EENG331	Electromagnetics - II	5	3	4	1
EENG341	Electronics - I	5	4	4	1
SCC-I	Selective Core Course - I	5	4	4	1
MATH322	Probability and Statistical Methods	5	3	3	1
UE01	University Elective - I	5	3	3	-
Semester 6					
EENG342	Electronics - II	6	4	4	1
SCC-II	Selective Core Course II	6	4	4	1
SCC-III	Selective Core Course III	6	4	4	1
UE02	University Elective - II	6	3	3	-
ENGL201	Communication Skills	6	3	3	1
Semester 7					
EENG405	Graduate Design Project Proposal	7	1	1	-
EENG403	Summer Training	7	No-Credit	-	-
SCC-IV	Selective Core Course IV	7	4	4	1
SCC-V	Selective Core Course V	7	4	4	1
AE01	Area Elective - I	7	3	3	-
AE02	Area Elective - II	7	3	3	-
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
ECON101	Introduction to Economics - I	7	3	3	1
IENG420	Fundamentals of Engineering Economy	7	3	3	-

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
IENG450	Industrial Management	7	3	3	-
Semester 8					
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
EENG406	Graduate Design Project	8	3	3	-
EENG402	Project - II	8	4	4	-
AE03	Area Elective - III	8	3	3	-
AE04	Area Elective - IV	8	3	3	-
UE04	Uni.Elecitive - IV	8	3	3	-
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
IENG355	Ethics in Engineering	8	3	3	-
PHIL401	Ethics in Professional Life	8	3	3	-

http://ee.emu.edu.tr/bs-eeng/

EMU full curriculum of Department Interior Architecture

Semester	Ref Code	Course Code	Full Course Title	Course Category	Credit				Prerequisites
					Lec	Lab	Tut	Tot	
1	72711	FARC101	Basic Design Studio	FC	4	0	4	**6**	
1	72712	FARC103	Graphic Communication -I	FC	2	0	2	**3**	
1	72713	FARC113	Introduction to Design	FC	3	0	0	**3**	
1	72714	ENGL191/ ENGL181	Communication in English- I/ Academic English -I	UC	3	0	1	**3**	
1	72715	MATH191	Mathematics & Geometry for Designers	AC	3	0	0	**3**	
1	72716	TUSL181/ HIST 280	Turkish as a Second Languageor Atatürk's Principles and Turkish Reforms	UC	2	0	0	2	
								20	
2	72721	FARC102	Introductory Design Studio	FC	4	0	4	**6**	FARC 101
2	72722	FARC104	Graphic Communication -II	FC	2	0	2	**3**	FARC 103
2	72723	ITEC105	Computer-I	UC	2	0	2	**3**	
2	72724	ENGL192/ ENGL182	Communication in English- II/ Academic English -II	UC	3	0	1	**3**	ENGL 191/ ENGL181
2	72725	INAR106	Freehand Drawing & Rendering	AC	2	0	2	**3**	
2	72726	FARC142	Introduction to Design technology	FC	3	0	0	**3**	
								21	
3	72731	INAR291	**Interior Architecture Studio- I**	AC	4	0	4	6	FARC 102 FARC 103
3	72732	INAR211	Human & Social Factors	AC	3	0	0	3	
3	72733	INAR213	Presentation Techniques	AC	2	0	2	3	
3	72734	INAR223	History of Art & Design	AC	3	0	0	3	
3	72735	INAR231	Concept of Structures	AC	3	0	0	3	
3	72736	INAR281	Computer Aided Design	AC	2	0	2	3	FARC 103
3	72737	INAS100	Summer Practice- I	AC	0	0	0	0	
								22	
4	72741	INAR292	**Interior Architecture Studio -II**	AC	4	0	4	6	INAR291 FARC104
4	72742	INAR206	Measured Drawing	AC	2	0	2	3	
4	72743	INAR207	Color & Lighting for Interiors	AC	3	0	0	3	
4	72744	INAR224	Styles & Fashion	AC	2	0	2	3	
4	72745	INAR246	Construction & Materials for Interiors	AC	2	0	2	3	FARC 104 FARC 142
4	72746	INAS200	Summer Practice- II	AC	0	0	0	0	
								19	
5	72751	INAR391	**Interior Architecture Studio -III**	AC	4	0	4	6	INAR 292
5	72752	INAR323	Philosophy of Art & Design	AC	3	0	0	3	
5	72753	INAR341	Bldg. Materials & Application for Interiors	AC	2	0	2	3	INAR 246
5	72754	INAR347	Integrated Systems	AC	2	0	2	3	

5	72755	AE01	Area Elective -I (Comp. Aided Presentation)	AE	2	0	2	3	
								19	
6	72761	INAR392	**Interior Arch. tudio -IV**	AC	4	0	4	6	INAR 391
6	72762	INAR348	Finishing & Detailing	AC	2	0	2	3	INAR 246
6	72763	AE 02	Area Elective -II	AE	3	0	0	3	
6	72764	AE 03	Area Elective -III	AE	3	0	0	3	
6	72765	UE01	University Elective -I	UE	3	0	0	3	
6	72766	INAS 300	Summer Practice-III	AC	0	0	0	0	INAR 291
								19	
7	72771	INAR491	**Interior Arch. Studio- V**	AC	4	0	4	6	INAR392 INAR 341
7	72772	INAR403	Furniture & Fixtures	AC	2	0	2	3	
7	72773	INAR 415	Desgin Research	AC	2	0	2	3	INAR 392
7	72774	AE 04	Area Elective -IV	AE	3	0	0	3	
7	72775	AE 05	Area Elective -V	AE	3	0	0	3	
								18	
8	72781	INAR492	**Interior Arch. Graduation Project**	AC	4	0	4	6	INAR491 INAR 411
8	72782	INAR408	Professional Issues & Portfolio Preparation	AC	2	0	2	3	INAR 391
8	72783	UE02	University Elective-II	UE	3	0	0	3	
8	72784	AE06	Area Elective -VI	AE	3	0	0	3	
								15	

http://ww1.emu.edu.tr/en/programs/interior-architecture-undergraduate-program/c/882?tab=curriculum

EMU full curriculum of Department Mechanical Engineering

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
Semester 1					
MENG104	Engineering Graphics	1	3	2	3
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
ENGL191	Communication in English - I	1	3	3	1
ENGL181	Academic English - I	1	3	5	1
MATH151	Calculus - I	1	4	4	1
PHYS101	Physics - I	1	4	4	1
CMPE108	Algorithms and Programming	1	3	3	1
Semester 2					
MENG190	Introduction to Mechanical Engineering	2	1	-	2
CHEM101	General Chemistry	2	4	4	1
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
ENGL192	Communication in English - II	2	3	3	-
ENGL182	Academic English - II	2	3	5	1
MATH152	Calculus - II	2	4	4	1
PHYS102	Physics - II	2	4	4	1
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
MATH106	Linear Algebra	2	3	3	1
IENG450	Industrial Management	2	3	3	-
Semester 3					
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
TUSL181	Turkish as a Second Language	3	2	2	-
HIST280	Atatürk`s Principles and History of Turkish Reforms	3	2	2	-
MENG203	Experimental Methods for Engineers	3	2	2	1
MENG286	Material Science	3	3	3	1
MENG245	Thermodynamics - I	3	3	3	1
CIVL211	Statics	3	4	4	-
MATH207	Differential Equations	3	4	4	1
Semester 4					

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
MENG201	Mechanical Workshop Practice	4	2	1	3
MENG246	Thermodynamics - II	4	3	3	1
MENG222	Strength of Materials	4	4	4	1
MENG233	Rigid Body Dynamics	4	4	4	1
EENG225	Fundamentals of Electrical and Electronic Engineering	4	3	3	1
ENGL201	Communication Skills	4	3	3	1
Semester 5					
MENG353	Fluid Mechanics	5	4	4	1
MENG364	Manufacturing Technology	5	4	4	1
MENG331	Dynamics of Machinery	5	4	4	1
MENG375	Machine Elements - I	5	3	3	-
MATH373	Numerical Analysis for Engineers	5	3	3	1
Semester 6					
MENG332	Control Systems	6	4	4	1
MENG345	Heat Transfer	6	4	4	1
MENG376	Machine Elements - II	6	3	3	-
MENG303	Principles of CAE	6	3	2	3
MATH322	Probability and Statistical Methods	6	3	3	1
Semester 7					
UE01	University Elective - I	7	3	3	-
MENG400	Industrial Training	7	No-Credit	-	-
MENG410	Introduction to Capstone Design	7	1	1	-
AE01	Area Elective - I	7	3	3	-
AE02	Area Elective - II	7	3	3	-
IENG355	Ethics in Engineering	7	3	3	-
IENG420	Fundamentals of Engineering Economy	7	3	3	-
Semester 8					
UE02	University Elective - II	8	3	3	-

Course Code	Course Title	Semester	Credit	Lecture Hour (hrs/week)	Lab / Tutorial (hrs/week)
Aşağıdaki ders grubundan, o dönem açılacak derslere göre sadece 1 ders seçilecektir.					
MENG492	Capstone Team Project	8	4	2	5
MENG411	Capstone Team Project	8	3	1	4
AE03	Area Elective - III	8	3	3	-
AE04	Area Elective - IV	8	3	3	-
UE03	University Elecitive - III	8	3	3	-

http://me.emu.edu.tr/?page_id=303