A Proposed Faculty of Architecture Building for Lead City University

(Evaluation Of Natural Lightning in Faculty Buildings)

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Certification

This is to certify that I **Oluwasgeun Kayode OBISESAN** with matriculation number **LCU/PG/002138** carried out this research work titled "Evaluation of Natural Lightning in Faculty Buildings" in the Department of Architecture, Faculty of Environmental Design and Management, Lead City University, Ibadan Nigeria for the award of Master Degree in Natural lightning and that this has not been previously submitted.

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Dedication

This study is whole heartedly Dedicated to God almighty, for His Great grace, strength, protection, provisions and for giving me a healthy life to complete this programme.

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Abstract

Natural lighting can be described as the controlled admission and entrance of light such as the direct sunlight, and diffused skylight into a building. Electrical light which serves as an alternative source of light into a building comprises of different spectrums and wavelength which has adverse effect on human body. Meanwhile, the entrance of a proper and adequate natural lighting into a building has been found to have significant positive effect on building occupant. Therefore, this study aimed at appraising natural lighting of selected National and international architecture buildings with a view to garner sufficient theoretical information that can inform the proposed design of the Architecture Faculty building of the Leads City University. It can be inferred from the case studies examined in this work that the international architecture buildings had adequate natural lighting features hence building occupants enjoys more benefits of natural lighting. Upon the completion of the appraisal, useful information that can inform the design of the proposed Faculty of Architecture building, Leads City University were noted.

Chapter One

Introduction

1.1 Background of the Study

Using outside glazing, such as windows, skylights, etc., natural lighting, commonly referred to as daylighting, is a technique that effectively lets natural light inside a building. In order to reduce the need for electric lighting and save energy, Ander (2016) defined daylighting as the controlled entry of natural light (such as diffused skylight and direct sunshine) into a building.

According to Phillips (2004), the lives of inhabitant in the earliest claves was informed by natural lighting - this helped them differentiate the night and day. However, due to better building designs, the inclusion of window openings was adopted. Thus, the history of natural lighting in architecture can be associated with windows for allowing light and air, heat and cold into the building. Therefore, the window can be considered as the vehicle for the introduction of daylighting which ultimately resulted in the sophisticated building designs of the 21st century.

One of the primary sources of natural lighting available to man is sunlight. Sunlight is a form of solar energy which is either absorbed, reflected, and/or transmitted. A relative movement between the Earth and the sun results in different latitudes, seasons, times, and elevation angles of the sun (Kaheneko 2021). Notwithstanding, other forms of daylighting are generated from external reflection - light reflecting off of ground surfaces, adjacent buildings, light shelves, and wide window sills, and internal reflection - light reflecting off of internal walls, ceiling, and the floor of your home. Highly reflective surfaces such as smooth or glossy surfaces, light-coloured finishes, and mirrors around a room also contributed to internal reflection (GHTM 2022).

Furthermore, natural lighting has been adjudged as a powerful architectural tool when making building designs (Gullotti 2009). By gathering natural light and reflecting it into the darker regions of the building, it passively supports the quality and even distribution of daylight across a structure. Any specialized mechanical equipment or energy sources are not needed in a structure with a sufficient natural lighting scheme. The passive daylighting techniques collect and reflect light throughout the structure as soon as the sun rises.

To attain adequate natural lighting in buildings, the science of daylighting emphasizes the need to ensure balancing between heat gains and losses, glare control, and variations in daylight availability to avoid undesirable effects (Gullotti 2009; Ander 2016). Some of the daylighting fixtures are windows, skylights (passive or active), Tubular daylight devices, Daylight redirection devices, and solar shading devices.

Generally, natural lighting in building designs saves energy (Edwards and Torcellini 2002; Singh 2018), meet the mental and physical needs of human (Javadnia 2016), optimize visual comfort (Callejas et al. 2020), improves psychological and human well-being (Singh 2018), determines the type of decoration and colour selection (Singh 2018). More importantly, it has been reported to aid student performance and learning (Gullotti 2009; Cheryan et al. 2014).

1.2 Statement of the Problem

Electrical light is an alternative source of lighting. Examples are cool white fluorescent, incandescent, energy-efficient fluorescent, and full-spectrum fluorescent lighting. These types of lighting have different spectrums and wavelength of light that has effect on the human body, thus affecting the building occupants. Most alternative sources of lighting lack the spectral distribution needed for complete biological functions of human beings. (Hathaway et al. 1992).

Cheryan et al. (2014) opined that specific features in classroom building are germane to maximize students' achievement. In their work, they identified inadequate natural lighting as one of the features inhibiting students' performance. Also, Küller and Lindsten (1992) reported that working in classrooms without daylight can alter the hormonal pattern in students, thus affecting their capacity to concentrate and cooperate, hence leading to medical issues. About 16% of schools with permanent buildings and 28% of schools with temporary (i.e., portable) buildings have natural lighting that is unsatisfactory or very unsatisfactory in Washington D.C., USA (Lewis et al. 2000), and as such Benya (2001) recommended the incorporation of daylighting into unsatisfactory classrooms.

However, inappropriate natural lighting in the designs of buildings comprising classrooms is prone to more disadvantages in that it allows for the uncontrollable entrance of heat, noise, and solar radiation. A non-carefully thought-out architecture academic building design results in temperature increase and visual discomfort for both students and lecturers, thus ultimately making the building unsuitable for learning.

Again, there is a dearth of scientific information on the natural lighting of buildings constructed for academic activities in Nigeria Institutions, and their impact on the academic performance and wellness of students and lecturers.

With the aforementioned, it is critical to note that inadequate consideration of natural lighting in the proposed Architecture Faculty building design will impede the academic performance of students of Leads City University.

1.3 Aim and Objectives

This study aims at appraising the natural lighting of selected National and international architecture faculty buildings to assess the adequacy of natural illumination with a view to garner sufficient theoretical information useful for the proposed design of Architecture

Faculty building, Leads City University, Ibadan, thus enhancing students' academic performance.

1.3.1 Objectives of the study

The objectives of this study are to

1. Assess the adequacy of natural lighting in the design and construction of selected local and international architecture faculty buildings
2. Identify design and construction strategies that can encourage the use of natural lighting in a faculty building.
3. Propose a naturally lighted Faculty building for Architecture, Lead City University.

1.4 Research Questions

1. How adequate is the use of natural lighting in the design and construction of selected case studies?
2. What design and construction strategies can be employed to achieve naturally lighted Faculty building for Architecture?
3. How do you design a naturally lighted Faculty building for Architecture, Lead City?

1.5 Significance of the study

Artificial lighting has provided an alternative source of lighting, especially during the night, however it has not been found optimally suitable in academic building designs. Edwards and Torcellini (2002) gave some of its disadvantages as misinterpretation of colours, dull lights, and having a various spectrum of light that may be dangerous to the eyes. On the other hand, natural lighting is considered quiet, soft, and real. Additionally, natural lightning in classroom buildings gives a range of benefits and importance to teachers and students in health, class attendance, academic achievement, and finance (Bailey 2000).

A research article published by Tanner (2008) proved that students exposed to natural light in their classrooms performed academically better between 2-26% than students exposed to lesser natural light, in the United State of America. Another study conducted in the United Kingdom concluded that exposure to natural daylighting made students finish their assignments 20% quicker (Heschong, et al. 2002). Also, Callejas et al. (2020) attributed the performance of students to the advantages of school opening within the sunlight hours.

Apart from the significant impact of natural lighting on the academic performance of students, it was also concluded in the study of Yu, Su, and Chen (2014) that taking advantage of daylighting in educational buildings saved about 40 to 60% of energy annually in the United Kingdom.

Electric lighting had provided alternative sources of lighting required in buildings however, energy and environmental concerns have made daylighting a rediscovered aspect of building lighting design. Although the physics of daylighting has remained the same since its original use, the building designs using it have changed overtime. Beyond the architectural integration of daylighting into a building, it also provides the psychological and physiological benefits to building occupants. Thus, adequate daylighting should be highly considered in building designs. Furthermore, daylighting provides a significant energy savings to building owners and managers, and has been associated with higher productivity, lower absenteeism, fewer errors or defects in products, positive attitudes, reduced fatigue, and reduced eyestrain. (Edwards and Torcellini 2002)

The work of literature provided in this study is an indication that adequate natural lighting of academic buildings contributed to students' academic performance. However, despite the numerous importance and significance of natural lighting in classroom designs to the academic performance of students and lecturers, we found only little scientific information on the importance of natural lighting on academic buildings in Nigeria Institutions. Therefore, there is a need to appraise the natural lighting designs of selected academic buildings such as the architecture faculty buildings of selected academic institutions in order to inform the design of Architecture Faculty Building of the Lead City University.

The study of natural lighting designs of the selected architecture faculty buildings of academic institutions will help to determine the suitability of the site location, external and internal light reflection materials used, and ascertain the adequacy of natural lighting in the design and construction of the Architecture Faculty Building of the Lead City University. As such, it will aid academic performance of students of the Institution. Hence, relevant recommendation will be made

1.6 Scope of the study

This study will be limited to the investigation of natural lighting of the selected architecture faculty buildings. Also, useful information garnered will be considered in the propose design of the architecture faculty building of the Lead City University, Ibadan. Field assessment and will be employed where necessary.

Chapter Two

Literature Review

2.1 Conceptual review

2.1.1 Characteristics of natural light

This section reviews the characteristics of natural light based on the following: (1) The Source, (2) The Geometry, (3) Different Surfaces inside the Space and (4) Movement and Visual Perception of the Observer.

1. The source

There is light for a given particular place or space (Chi, Moreno, & Navarro, 2018), and this light expressing place can be a function of the place itself, its physical feature and characteristics which thus makes it different from any other place; and the particular set of changes that take place within it over time, creating distinctive patterns of diurnal and seasonal changes." By implication, it determines the changes and ways light interact with the built environment.

Also, the openings in an enclosure introduced a new source of light. This is a general practice that has acquired universal meanings of architectural expression from the distinct meanings associated with light of the place, thus corroborating (Phillips 2004) who states that "The appearance of buildings of all periods reflects the nature of windows …"

Additionally, an enclosure's openings added a new source of light. This common practice has taken on universal architectural meanings from the various meanings linked with the local lighting, supporting (Phillips 2004) who claims that "The appearance of buildings of all periods reflects the nature of windows..."

The window is regarded as a significant part of the "spatial record" that connects a building's interior and exterior. While its placement dictates the direction in which attention is focused, its relativity to the solid wall aids in determining the sense of separation from or connection to the outside. It defines the transition between the interior and exterior with its subtle details (Chi, Moreno, & Navarro, 2018). A place is transformed and given personality by the passage of natural light from the exterior to the interior of a building.

The three important factor relating to sources of light and effect on perception of space are (a) intensity, (b) Directional Characteristics and (c) Colour. (Chi, Moreno, & Navarro, 2018)

a. Intensity

On many occasion, people judge the perception of a material or object with respect to light intensity emanating from the source. (Lam 1977) noted that an emotion is an effective component used in responding to an environment perceived to be luminous. A space is often considered adequate when adjudged by factors such as brightness, lighting, sparkle, interesting etc. these factors are measurements of a luminous environments and can determine the satisfaction we derive from an environment.

b. Directional characteristics

The transmission of sun through the sky determines the characteristics of the direction of natural light to the earth. As such, any physical interruption or boundary plane in the directional characteristics of the natural lighting can cause a depth of shadow and contrast among surfaces. Hence, spacing is characterised and associated with the direction of natural light as it helps to achieve a reasonable link with lighting at a period of time and season in the year. The puzzle behind the traits created by shadows was enumerated by Japanese architect (Tanizaki 1977). Thus, a beautiful Japanese room was found to be attributed to the different shades of shadows, ranging from soft to heavy shadow patterns.

According to (Tanizaki 1977), the secret behind shadow mystery which the Westerners perceived to be walls made of ashen without ornament can be better comprehend through the directional characteristic of the rays of light from the sun which can barely reach the sitting room. To achieve this, the eaves of the veranda were extended while the garden light was made to softly pass through a paper-panelled door resulting in an indirect lighting which upholds the beauty of the room.

Another importance of directional characteristic of lighting is the contrast. Contrast was listed as one of the necessary characteristics needed when designing a space (Chi, Moreno, & Navarro, 2018). It differentiates between the bright and dark which could be useful when studying a comprehensive scene depth.

Seeing and living is by contrast because it brings about and make us aware of the characteristics of opposite things. For example, lighting is needed to jettison darkness. The advent of contrast introduces varieties in the environment which restores and make us conscious. As opined by René Dubos warns, uniformity of the environment and behavioural/taste compliance should be discouraged, but rather endeavour to diversify the environment as much as possible through means such as lighting: a condition which could involve the use of fire flames, candlelight, filtering of sunlight from leaves or smooth water surface, sky light, and signs from neon. As such, light is an unavoidable part of human life (Chi, Moreno, & Navarro, 2018).

c. Colour

colour is another innate scientific feature possessing radiant energy (Solon 2006). As a form of energy, it is effective in controlling the aesthetic value of an environment in that. The operative phenomenon characteristic is by producing a decorative direct visual ecstasy which then have a consequential effect on crucial properties of the architectural design, unless otherwise regulated. Hence, architectural design elements which must not bear depreciation as a result of colour must be carefully considered. As such, only nature and location of colour reaction that is advantageous to architectural designs should be researched and accommodated. It was also found that space perception can change with respect to colour; that is, a room looks bigger in size when the colour is light because more rays of light is reflected when lighter colour is used. On the other hand, a room is smaller when a darker colour is used for panting. This is because light rays tend to be absorbed by darker colour. Also, colour has been found to change with respect to time of the day. The colours are changed by the different intensity of natural light from the sun during the morning, afternoon or evening. Human often adjust to these changes by perceptions when occupying such space at different times of the day. These changes are part of experience and diversification of the environment (Phillips 2004).

2. The geometry

The shape structure and forms define the geometry of a space. Similarly, light cannot be perceived except when it is in form, and vice versa. Worth noting is the fact that no permanent form of visible lighting from natural light, that is natural light producing visible form of light is always changing. However, our perceptual process enables us to perceive a stable form of light. The better we can distinguish the different forms of light, the better the clarity of using light to emphasize the forms. Meanwhile, the shadows can be of help in the determination of form and the spatial depth perception.

A clearer day better describe forms, as compared with a cloudy day. However, a form can be dematerialised by light if a secondary source of light is the reflecting surface, and it blocks a clearer sighting of the form. Also, when light is extremely bright or dark, and it moves blurring details of a material, the form can be dissolved. Also, the structure can be hidden by light when the pattern and rhythm of light and structure are in contrast. A major reason for contrast is our expectation of the structure whereas light can find its expression in an unexpected way (Chi, Moreno, & Navarro, 2018).

3. Different surfaces inside the space

The reflection, refraction and absorption properties of light from a source are determined by the surface properties of a material. Hence, the quality and quantity of light present in a space can be affected by the material. Furthermore, the two essential feature of consideration in this instance are the finish and colour of the material. Reflection is better at glossy surfaces because its reflection ability is similar to that of a mirror. Meanwhile, the three colour traits that determines the rate of absorption or reflection of light are value, intensity and hue. Where a coloured surface is used, the hue of the material is carried by the light passing through it.

There are three kinds of interaction between light and material that help to achieve the emphasis on materials; they are highlights, revelation, and dark shadows. A glazed material produces a good highlight. Revelation of the material's innate qualities is revealed when light passes through them whereas dark shadows is formed on the absorbing material which resulted when there is a deflection of light. However, the effect of light on a material can be underplay by selecting surfaces of different material (Chi, D. A., Moreno, D., & Navarro, J. (2018)).

4. Movement and visual perception of the observer

Our system of perception in its entirety plays a vital role in our experience of a space. Space is not explored from a static point but through the movement from one place to another. Thus, our experience and presumption partly inform our perception of space. By walking around in a room, the system of our visual perception informs us of the invariant structure of the environment and the relationship we have with it. The structured light is in accordance to its source and environmental surfaces to enable an adequate illumination sufficient to provide information about the room. Consequently, we consider the room's physical structure as unchanged while still reacting to changes in the patterns of light (Chi, Moreno, & Navarro, 2018).

2.1.2 Historical perspectives on natural light inside the buildings

In the early eras, the sunlight was identified as the only source of natural light which played significant role in the building of space before the advent of huge dependence of artificial sources of light. The availability and access to electrical light as one of the artificial sources of light has made the huge shift from natural lighting possible in the last century. The static artificial lighting was introduced to manage the rising need for illumination inside a space, thus sacrificing the beauty of the differences in the traits and space ambience accompanied by the rising and setting of the sun across the sky, which changes the seasons. Another disadvantage resulting from this shift is increased dependence on energy weakens the strong relationship between the interior and exterior spaces.

The use of natural can be dated back to primitive days where heavy rays of sun is allowed to enter into the utmost dark part of the cave. Up until now, the primary source of illumination was natural light which is being controlled by different methods such as different designs of shelters constructed by humans who needs comfort and survival. The innate and artistic nature of natural lighting as reacted to by difference surfaces brought about the different unique ways of exploring natural lighting. The design and concept of daylighting has a symbolic meaning owing to means of entrance into a space while casting shadows on different surfaces. This section of the review focuses on the use of natural light in built environment of its different form with respect to their historical period. The symbolic meanings of natural light and method of control to create the different artistic effects inside a built environment was emphasized.

(Phillips 2004) made reference to the history of windows in daylighting, where he highlighted the inclusion of window in the history of architecture. As such, the emergence of buildings is synonymous to the nature of windows. In mediaeval period, the efficiency of windows in the entire natural lighting of interior spaces were attributed to the design and location of windows.

In the Renaissance period, and as windows became formal objects, changes to the concept became evident. Windows were then seen as a means of building elevation thus having a disconnection with the interior spaces.

For instance, the slit windows having splayed sides were used for military needs, as it helps to minimize the entire contrast when light spreads along the interior wall surface. Whereas, an Indirect lighting was explored in the construction of Baroque churches of southern Germany, here, the windows were concealed to give a direct view from the congregation. In the seventeenth and eighteenth centuries, vertical windows in the exterior façade were found to be adopted window designs used, while roof lighting was allowed to serve as daylighting at the centre of the buildings. Consequently, architect considers the centre areas in the layout plan in order to receive adequate daylight from the different types of roof openings.

In the early effort to modernise the uses of window in England in the 1930s, the use of full walls of glass and wrap-around windows at corners was attempted in order to establish the relation between the external and internal spaces. In the same vein, further attempts were made in the nineteenth century when the demand for illumination was growing thus forcing higher requiring a more dependence on a regulated environment of artificial lighting enabling primary illumination. As at the middle of 1960s, the choice of artificial lighting gave birth to the emergence of building without windows thus depreciating the advantages of the interactions between building interiors and the natural environment.

Historical response on daylighting in buildings and its environment was summarised by (Tahbaz, M. (2017)) he reiterated that aside the illumination functions in spaces of natural light, the symbolic meanings of natural lighting can also be categorized into purity, knowledge, heaven and purity, and further classify its uses into Preindustrial, Industrial and Post-industrial Architecture which have been discussed below with further subheadings.

2.1.2.1 Preindustrial architecture

Some of means light is introduced into a space was revealed by the ancient civilizations. Such means include the openings of both large and small windows which helped in creating different effects that shows the intensity light entering a building.

a. Egypt

In ancient Egypt, there were restrictions on the openings of light thus resulting into limited freedom provided by the structure and unfavourable climate. This gave room for low and diffused sunlight through the thick walls of masonry while during the transformation process the rays of sun would be made to go through many side reflections. The openings of the Clerestory which is carved with grills brings soft lighting into the deep of the large temples hence supporting sequence geometry of the inside space (Tahbaz, M. (2017).

Egyptian temple are known for creative use of lighting which reveals the understanding of sunlight effects on a grand scale, especially in the desert landscape (Baker and Steemers 2002). Light contrast and shadow formed in building spaces are of three-dimensional forms which are evident through sunlight intensity. Their building plans take into consideration the forms and space sequence which aids the accentuation of processional movement (light to dark).

b. Greece

The gentle Greece climate is responsible for the entrance of a strong narrow shaft light in their temples. The orientation of the temples to face the east allows rays from the rising sun to penetrate doorways and make the statues shine brighter while sky light that are diffused are reflected to show the ornament forms and decoration of the structure. The use of a sundial orchestrated by a principled planning ensures that sun from the winter penetrated deeper into the spaces. (Tahbaz, M. (2017).

The utilization of strong daylight in Greek temples was pointed out by (Baker and Steemers 2002) to show the façade depth. In furtherance, accentuation effect was achieved in front of the stone walls by layers of closed space column forming the shadows. The column shafts have sharp fluted channels that can only be seen in profile when there is a change in light and shade patterns of the vertical lines.

c. Rome

Early buildings in Rome are associated with dimly lit interior spacing which are caused by structural inadequacy of the post and beam construction thereby aiding smaller window openings consequently affecting the advancements in Roman Period. On the other hand, the Egyptian and Greek monuments accommodated the use of sunlight to portray the exterior form and surface modelling while the Roman and Gothic monuments illustrated the structures' integrity and the light path into a space (Baker and Steemers 2002).

Inferentially, it can be pointed that the architectural developments in Rome depicts more knowledge and understanding about natural lighting principles. As a result, the advantages derived from this structural competence has helped to introduce a large columned interiors and window openings capable of allowing the entrance of light sheets deeper inside the space. Also, to make light path visible in a space, the skylight and concealed clearstory windows were employed. This effect was strongly exemplified by the Pantheon stands (Tahbaz, M. (2017).

d. Early Christian

The early Christian architecture identified with a particular basilica building type as it is well-known forms for religious activities. This building type was borne out of efforts to improvise using timber trusses to substitute for Roman concretes consequently causing a reduction in wall area to accommodate the clerestory windows. The mystical nature of spatial layout was made possible by the low levels of light available in the building by boosting the linear perspective for the altar and religious activities, that are connected to the apse receiving greater visual concentration due to surrounding windows in its semi-circular plan (Tahbaz, M. (2017).

e. Byzantine

The characteristics of the Byzantine architecture was informed by the utilization of dome brace at four points only, and covers the rectangular plan form thus allowing the small opening of, stained-glass light at the base of the dome making it look as though it is floating above the structure supporting it. It was also noted that mild change occurs in the plan layout of the basilica church during the Romanesque period. The mystical quality of the space was undamaged with the help of a relatively smaller windows (Tahbaz, M. (2017).

f. Renaissance

Research finding on light quality was carried on throughout the Renaissance period. Experiments were carried out on the ceilings and thick walls to deeply recess the openings of light that can allow dramatic quality of light that was employed to stress earlier seen forms. The structure of the dome comprises of different carved shells to aid the path of daylighting entering from the top part of the dome (Tahbaz, M. (2017).

The lighting was more associated with metaphysical link existing between the soul and object which boost the sense of life. Attention was given to natural quality that initiated the evolving and linking emotional response to light. Effective use of sunshine to support shape and emphasize space was made possible by an apparent conflict between visual harmony and proportion (Baker and Steemers 2002).

g. Baroque

Lighting took the centre stage in the early sequence of investigation conducted on the premises of Borromini. The rise in light control to achieving the desired effect was demonstrated in spatial enclosure where incident and reflected ray of light were fused in an utmost refined technique. The entrance of light was introduced into space by controlled openings of the modular proportioning of the façade towards the end the eighteenth century, (Portoghesi 1994).

Sculptural exuberance and dynamic spatial qualities were used to define the Baroque architecture. The form's articulation, which provided greater control over how light was perceived in the space through the overlapping levels of enclosure, received a fair amount of attention. Transcendence from the earth to the heaven was recognized by the inescapable spatial enclosure that serves as an enigmatic light quality created from the perforated vaults. Additionally, the use of a sufficient number of deeply recessed openings to diffusely illuminate the interior produced an air of mystery and deception, and the employment of oblique light beams to highlight many of the sculptural decorations produced three-dimensional forms by using shade and light (Baker and Steemers 2002).

2.1.2.2 Industrial architecture

With the help of advancement in technology, the relationship between interior and exterior form of buildings was changed through industrial revolution, thus, minimizing the inter-dependence of one over the other was minimized so much that effect of environmental conditions can be ignored. For this reason, architects are no longer constrained in the design of building forms as there is now sufficient freedom for architect, thus settling giant slides for course shift for architect in the future. Steel was also used a structural member to nullify the essence of traditional load bearing walls with a thin outer skin. As a result, research began to concentrate on the prospect of examining the uses of big sheets of glass in the outside to increase the levels of illumination (Tahbaz, M. (2017)).

(Baker and Steemers 2002) cited the railway sheds built in the 1830s and 1840s as an example of the use of iron strength to create a structural framework that could expand the interior space and eliminate load bearing on walls. Additionally, it was believed that the fusion of light and space would result in more freedom.

Upon the reduction on dependence of natural sources of light caused by arrival of electrical lighting, it is now an attainable feat to have higher floor area that are not close to the exterior environment. As such, windows are now less operated and ceiling heights were reduced.

with the abundance production construction materials and electrical lighting, changes were evident in the entire concept buildings thus convincingly defining the beginning of a modern era with new vertical limits (Tahbaz, M. (2017)).

Consequently, a building design such as deep plan, high rise, tower blocks which are artificially lit, heated and cooled can be constructed in complete isolation from the external environment, while steel and glass can be used as cover (horizontally and vertically) in large spaces. Where large sheets of glass is used in the perimeter, it helps to provide high levels of daylighting at an increased cost of glare, unrestrained solar gain among other.

There are still issues with its uses for analyzing illuminance level because it is still unable to shed light on the emotional content of the luminous environment and explain space beauty, despite scientific advancements in the measurement of light levels that have helped to achieve the desired and deserved levels of lux on the work plane (Baker and Steemers 2002).

There was an increase of prominent architects who took advantage of the newly emerged freedom in the modern usage of structure and materials for new building forms. Some of such pioneer architects are Corbusier, Wright and Aalto. While keeping the traditional characteristics of natural ventilation, site orientation, and daylight illumination, they investigate innovative construction technologies for novel dimensions. (M. Tahbaz, 2017)

2.1.3 Effects of Light on the Human Body

As identified by (Liberman 1991), the three sources of light used in artificial daylighting does not contain the blue healthy and most important portion of the colour spectrum for humans. They are;

1. The cool white fluorescent lights – it contains a high visible yellow to red portion in the light spectrum
2. The Incandescent lightining – it has a concentrated orange to red colour in its spectrum.
3. The energy-efficient fluorescent lighting – it has a typically concentration of yellow to green portion of the spectrum.

It was also mentioned that natural light offers the optimum spectrum of blue light. However, due to its strong propensity to create light in the blue region of the light spectrum, full-spectrum fluorescent artificial lighting is the closest to natural light. However, ambient lighting created by daylighting is superior to cool white or energy-saving fluorescent electrical light sources because it is more perceptible to the human eye and has a stronger emotional connection (Franta, G.; Anstead 1994).

Humans already love and come with terms with natural lighting because of its balanced and complete colour spectrum, having its peak energy at the blue-green area of the visible spectrum (Liberman 1991). Additionally, natural light provides the required level of light for biological purposes (290 to 770 nanometres of The photobiologic action spectra for humans with skin reddening and vitamin D synthesis occurring within 290 to 315 nanometres) (Hathaway et al. 1992).

Spectrum produced from light of different types have physiological and psychological effect on humans, but with the adoption of natural lighting, these effects are is less effective and can be easily jettisoned. Some of the advantages of daylighting to human are that it improves mood, boost morale, reduce fatigue and eyestrain. Also, it connect occupants with the external living environment (Robbins 2021).

Natural light serves as nutrient for metabolic activities in the body as it restores biological activities in the brain with respect to colours important to our health (Ott Biolight Systems 1997). It is expected that our mood and energy can be affected during a cloudy day or where there is poor lighting, as we find it difficult perceive and differentiate colours at this moment. It was also stated that light has a role to play in our health maintenance (Liberman 1991). This refers to the management of our physiological traits, nervous and endocrine system which are directly boosted and managed by lighting.

The evaluation of the effect of light in human health was studied by (Heerwagen 1986). He considered the effect on prison inmate having different window views. It was discovered that inmates having a meadow or mountain view have significantly lower stress-related sickness when compared with inmates having prison courtyard and building views. Similarly, inmates occupying the second floor reported a lower stress-related sickness than those occupying the first floor. It was concluded that the exposure of some inmates to expansive view and external natural environment were the reasons responsible for lower rate stress-related sickness as it contributes to positive psychological benefits. The inaccessibility of inmates on the first floor to natural lighting and lack of privacy largely due to the visibility of passers-by added to their sickness.

The chances that natural views will efficiently reduce stress and anxiety is high because it strives to produce positive responses and as such improve moods. Studies in 1979, 1981, and 1986 by Ulrich (Heerwagen 1986) proves the efficiency of natural views. Vegetation and water views was found effective for making psycho-physiological come back from stress. Similarly, people have recovered completely and faster from a stressful occasion when exposed to scenes of natural settlements rather than urban films.

2.2: Design consideration for a faculty building

An optimum situation in which people can function should inform the design of a school building (Uzuegbunam 2011a). He emphasized the significance of the building's intended use as well as the unique functional requirements for buildings. As a result, the task's requirements and the environment's limitations are used to determine what constitutes an ideal scenario. As a result, the actual use of any building project determines its uniqueness, which must take into account the project's components, requirements, and organizational structure. (2011) Uzuegbunam

Uzuegbunam (1996) attributed the difference between a prison cell and student dormitory to building programming. He stated that although they tend to serve the same purpose, the occupants of one are free, while the others are not thus, making makes a great difference.

A wide range of unique traits that must be clear in the building's planning are required for a setting to be successful for learning. School buildings, such as faculty buildings, are thought of as locations where children can study and work and play and communicate and mature. As a result, when designing a faculty building, the factors required to promote human growth must be carefully taken into account.

For instance, sensory aspects, such as temperature, visibility and acoustics, must be well controlled, and a warmth excited environment must be provided. (Uzuegbunam 2011b).

In addition, spatial organization has been pointed as one of the basic requirements in faculty buildings for effective teaching and learning in creative discipline. Different basic spatial requirements were found in different parts of the world. In Europe and America, the minimum acceptable standard studio space per person is 5 - 7sqm, and a maximum of 10 - 12 students per academic staff. Meanwhile, 4sqm per person and 12 students per academic staff is acceptable in Nigeria (NUC, 2003).

Additionally, according to Uzuegbunam (2011a), the size and shape of each unit within a building affects a project's viability. In order to keep party wall costs to a minimum, repetitive or standardized units have simple shapes. Additionally, outer walls can be fairly increased in relation to the enclosed space as needed in the humid tropics for enhanced efficiency, economy, and maximum natural ventilation.

In another view, the success of a faculty building design was hinged on climatic conditions (Kwok & Grondzik 2018). The effect of the nature of climate changes on human comfort is inevitable, but climate integrated design elements such as humidity, temperature, wind patterns, and rainfall takes advantage of this climate changes to produce a positive effect and reflection on the architectural building designs. Generally, the following point should be often considered in the climate integrated design (Kwok & Grondzik 2018).

1 “Sun control” to enhance visual comfort.

2 Understanding of the human’s basic physiology and thermal comfort.

3 Understanding of Climatic issues, especially the microclimates.

4 The use of thermal mass to improve comfort and efficiency.

5 Utilization of the local winds and breezes as much as can be harnessed, to improve comfort.

6 choosing the correct and effective material and design technique for a better result.

Similarly, (Uzuegbunam 2011a) suggested some structural properties to be considered for effective building design as;

1. To resist lateral loading of wind accompanied rains, building structure (especially the roof) is expected to be accurately anchored.
2. Provision of adequate drainage system to avoid flooding.

3. The roof design should be given a proper attention to aid effective discharge and rain water harvesting for use.
4. The use canopies, verandas, logia, eves, hoods can be employed to protect the openings on the external walls from the driving rains, as well as other architectural elements.
5. Trees should be planted during the coolest months are (January and December) to provide outdoor shade.
6. Heat gain reduction by minimizing the areas of concrete pavements should be minimized to reduce heat gain.
7. Air movement is essential, and therefore adequate ventilation should be ensured through the building.
8. Wind utilization can be optimized for effective ventilation through the choice of the building design. Consideration should therefore be given to the location and Size of openings. The type and level of the window should be in such a way to admit and maximize the flow of wind in the building.
9. Importance should be given to shading of the building from direct sunshine

A designed Faculty of Environmental Studies building with four departments, offices, classrooms and studios, the Dean's office, faculty library and ICT, and a conference hall of about five hundred sitting capacity for the University of Nigeria was done by Uzuegbunam (2011a). For adequate spacing, he proposed an allocation of floor spaces for each department, including the dean's office, thus, having a total of five floors. While relationship to physical spaces and technological systems to learning continues to be ever important, even more important is how, and whether, the environments support positive human relationships that matter to learning (Ingenium 2009).

The detail of the spaces with regards to size, number of students in each space, equipment demands, and special requirements were done according to the National Universities Commission, standards. The capacity of the classroom was designed to accommodate anticipated class growth. It was noted that the desirable capacity was determined from experience using class sizes, subject being taught, and conventional practices.

The adaptability of the spaces was another crucial factor that was taken into account during planning with an anticipated growth in mind. Classrooms that demand quiet spaces were situated away from busy activity areas, and spaces were created to be easily reconfigured for future purposes and configurations. The classroom spaces were particularly adaptable, with room for equipment storage, teacher presentations, and other uses. Direct, easy, and safe access was provided. There was plenty of room for efficiency and safety in the stairways, corridors, and assembly places. Schools have greater standards due to the nature of their purpose and occupancy. In addition to adaptability, the faculty building setting was designed for comfort, efficiently laid out, and sensitive to the practical demands of students, professors, and other patrons. Figure 2.1 and 2.2 showed the rear and front view of the proposed faculty building (Uzuegbunam 2011a) revealing natural lighting.

Figure 2.1 Rear view of the proposed Faculty Building, Environmental Studies, University of Nigeria, Enugu Campus. Source: (Uzuegbunam 2011a)

Figure 2.2 Front view of the proposed Faculty Building, Environmental Studies, University of Nigeria, Enugu Campus. Source: (Uzuegbunam 2011a)

2.3 Empirical review

2.3.1 Benefits of delighting in office building

It was reported that occupants exposed to daylighting comprising of full spectrum in office buildings had an increasing wellbeing. Such benefits are but not limited to reduced absenteeism, increase in productivity, more savings, and workers' preference. Many Eupean countries who understood the importance of these benefits advised that workers should be within 27 feet closer to the windows (Franta, G.; Anstead 1994).

Similarly, full spectrum has assisted workers working day/night their clock internally to fit into their working hours. Also, day lighting has contributed to productivity improvement, quality sleep, increase in morale, reduced accident and mental improvement among people working night shift (Luo 1998). Contrarily, where daylighting is absent or could not be integrated in buildings, and therefore do not have access to full light spectrum, workers' performance was affected.

2.3.1.1 Health in the Office

Health benefit of daylighting as reported by studies include the reduction in eyestrain, headaches and SAD (Franta, G.; Anstead 1994). It was also noted that insufficient light levels is one of the major causes of Headaches and SAD. With the help of the use of an adequate light spectral, these illness can be lessened, especially eye strain which is being adjudged as the major health challenge in offices (Ott Biolight Systems 1997).

Eyestrain often occurs as a result of the response of the eye to the light spectrum in the workspace which defines the capacity of the eye to stay focused. If proper management and integration is given to office daylighting, it will provide a good light spectrum to the eyes. Otherwise, the dilating muscles in eyes are restricted to a limited perspective when the eye is made to focus only on a specific distance with respect to time, hence resulting in short or long sightedness. The challenge of eyestrain can be reduced by creating a landscape view through the window, as this will help to refocus the eye because the view gives a combination of short- and long-range (Franta, G.; Anstead 1994).

On the other hand, the reduction in stress and the refocusing of attention can be improved when the view from the windows in the workspace contain a natural vegetation. The reduction in blood pressure and improved attention was found in a study conducted by (Heerwagen et al. 1998) for occupant of a windowless room having a view of plants when compared with others with a closed window. They further noted that employee exposed to daylighting have more positive mood which in turn lead to a better job satisfaction, motivation, involvement in work, higher presence at work, and are more attached to the organization.

Conclusively, discomfort and distraction were found to be the major cause of negative moods while social interactivities among employees and work's physical setting contributes to positive moods.

2.3.1.2 Productivity in the Office

Studies dated as far back as 1920s have shown the effects of light on productivity - an increase in light quality at office space increases worker's productivity, and up until now, the positive relation still remains unchanged. Furthermore, the test conducted on attention revealed that employees that have access to natural vegetation performed better (Heerwagen et al. 1998). Therefore, it can be said that importance of window views is beyond daylighting techniques only. Natural light has shown to improve attention and awareness during the post-lunch dip proves helpful in creating awareness for boring or monotonous work (Light, Sight 1998). Examples of company that benefitted from increased productivity as a result of implementation of improved lighting conditions are Lockheed Martin, VeriFone, West Bend Mutual Insurance, Pennsylvania Power and Light, and the Reno Post Office.

By utilizing open offices, Lockheed Martin designers recorded successful increased interaction among her engineers with integrated daylighting layout in their offices in Sunnyvale, California which helped increase their contract productivity by (Romm and Browning 1994).

2.3.1.3 Employee Preferences and Perspectives

Studies revealed office workers valued the presence of windows highly in their workplace. It was reported by about 35% employees that they are having difficulties in their working space to the unavailability of window (Collins 1975). Part of the comments highlighted to have caused these difficulties are inaccessibility to daylight, knowledge about the weather, poor ventilation, isolation, unavailable of vegetation views and cooped-up feeling thus leading to tension and depression. Corroboratively, (Finnegan and Solomon 1981) found that employees in offices without windows had lower satisfaction on their jobs.

Offices with any size of window were highly valued than private offices because it avail them the opportunity to access to better environmental views (Wotton and Barkow 1983). For this reason, employees had lower tolerance for office without windows because of knowledge of numerous advantages offices with windows can offer them thereby request large spaced offices at the upstairs of the building which can avail them a better view of the city (Collins 1975). According to (Wotton and Barkow 1983), about 745 employed survey prefers a workspace with windows close to them. The study further revealed that 57% do not preferred the windows to be in front or behind their workshop but beside.

Kit Cuttle investigated England and New Zealand office workers about attitudes toward workplaces in a 1983 study, and it was inferred that office workers believed that big windows are essential for any office environment as they prefer to sit close to the window. However, workers in lower cadre are often denied such privilege. The importance of natural light as well played out with four out of five workers opted to work with natural light because they feel uncomfortable working with electric lighting (Cuttle 1983).

There have been an expression of feelings from employee about their workspace in respect to daylight in office buildings. For instance, there were positive response from employees of Lockheed Martin building. Similarly, workers in the VeriFone building commented about better satisfaction they enjoyed while working in daylight spaces. As reported by one of the employee - “it was a wonderful experience in a building which give a feeling of working outdoor because there was streams of light into my workstation” (Sundaram and Croxton 1998). In an effort to compare a difference between to offices, they further claimed in their study that some employees’ previous office felt cooped in and all that was experienced was artificial light but a new office designed to accommodate natural lighting gave glimpse of the outside sky which made them feel good.

Additionally, Iowa Association of Municipal Utilities is another building considered to have successfully integrated daylight. The design of this building provides for energy efficiency techniques which lso makes it have ab inviting feeling. It can be concluded that the design goal fits well into daylighting. The energy service coordinator also commented on the building, stating that people are amazed when they enter into the building and they make encouraging comments such as wow, nice, and how the building allow for day lighting and air Patti Cale (2001). A commendable feature of that building is that it does not divide the occupants from the outside environment; workers can have a view what is inside and outside world through the window. (Cale 2001 *cited in* Edwards and Torcellini 2002) opined she would “prefer occupying this building against the traditional building simply it avails her the opportunity to see events happening outside.

Another building review in this study is the 3M Austin, Centre. It was gathered that an employee stated that the atrium of the building provides a relaxed, comfortable and welcome environment because there was little artificial lighting (Nick Lampe 2001). He further experimented by spending part of his day in an office workspace with windows away and the other part in an office where the windows can be opened to see the atrium two walls.

Lampe (2001) observed he stays alert and does not have a drowsy feeling in office space that are with more window space. However, he had to adjust his eyes to familiarise it with the direct sunlight entering his office in the morning, but yet still prefers his office setting to contain more windows to allow for natural light. Inferentially, (Edwards and Torcellini 2002) opined that natural light is effective and contributes to attitudinal changes, and breaks spent in the daylight atrium is refreshing. Conclusively, (Lampe 2001) agreed that a more natural environment in the center is calming, motivating, and puts him in a better mood. Therefore, the integration of natural light into building offices is of great importance to the occupants.

Another building that has been adjudged by visitor as friendly is the Story County Human Services building, Employees confirm their love for the windows and given kudos to the wonderful building structure (Shipper 2001 *cited in* Edwards and Torcellini 2002).

2.3.2 Improper Daylighting

Studies have shown that staff and employers can substantially benefits from daylighting alike. However, the abuse of natural lighting can result to unfavourable conditions within the structure. Hence, to enjoy the benefits, daylighting techniques must be correctly implemented. Otherwise, an improper utilization of daylighting can affect productivity and increase employee absenteeism caused by exposure to higher lighting levels, temperature, and excess glaring.

As investigated, some of the tactics employed by workers to minimize discomfort in an energy efficient buildings are changing of clothes, going for a break, walking around, making complains, and getting something to drink (Heerwagen, Loveland, and Diamond 1992). However, all these tactics were confirmed ineffective. Hence, fatigue, work dissatisfaction, loss of work efficiency, and lack motivation can possibly occur. Where employees are compelled to continue working, mental energy to deliver on their respective jobs may be absorbed instead. Therefore, a comfortable working space is essential to aid employees on their given task.

One of such building that had a glaring problem is the Iowa Association of Municipal Utilities building despites it was designed for indirect lighting. In order to correct high glare problem, the hung a semi-opaque fabric at about six feet away from the windows for two to three months of the year (Cale 2001). There was also an installation of venetian blinds on another portion of the east side of the building. These blinds help to enhance room darkness for multimedia presentations, and glare reduction. Tutorials were also done for new employees on how to orientate the computer monitors in their workspaces to reduce glaring. This is in order to prevent other and reoccurring glaring issues.

Comments by an employee of the VeriFone building explains his dissatisfaction from glare issue, especially in the afternoon.as a results he takes a break from the computer as thus hinders him to work as he cannot see anything (Sundaram and Croxton 1998).

More potential problem caused by improper designed and management of daylight was noticed in the Hughes Corporate Headquarters building. Although the building set out to accommodate daylighting designs but it was poorly planned and implemented. As such, the effect of glare and high light levels were too much to tolerate that workers began to wear sunglasses to office among other safety measure deployed by employees. Hence, the employees' perception of the building began to turn negative.

There have been complains from occupants of an improperly design building of either the daylighting or non-daylighting ones. The human insatiable nature and criticism were identified as some of the reasons as only few staffs are ready to accept what they were offered as offices (Collins 1975). The simulation or real daylight dimming system devised to keep illuminating the working space may have also led to the lighting-level criticism.

This is because study revealed that the dimming system could not meet human expectation and response due to its simple working principle (Begemann, Van Den Beld, and Tenner 1997) nevertheless, some employees in one of the daylight building studied by (Bryan 1998) were willing to cope and accept the glare levels owing to the building good quality.

2.3.3 Daylighting in Schools

There are benefits a properly managed and integrated daylight can render to school children and teachers. Some of such benefits are improved students' academic performance and attendance, reduction in utility cost for school districts, and a less stressed environment for students.

(Edwards and Torcellini 2002) reported an increase in attendance of student and teacher, improved achievement rates, increased student health, reduced fatigue factors, and boosting general development. Additionally, flickering from electrical light sources and noise easily be eliminated where natural lighting is used as it gives the best light quality suitable in classrooms, corridors, and gymnasiums. Meanwhile, some of the disadvantages in keeping students in a windowless classrooms are that students becomes more hostile, maladjusted, and hesitant. They also complain and find their work less interesting.

2.3.3.1 Achievement

(Mangkuto, Koerniawan,& Soelami,(2021) concentrated a study on the benefits of daylighting on students of the North Carolina Johnston County schools. A comparison was made between the scores obtained by students occupying a newly constructed daylight buildings to those with artificially light. It was discovered that a higher reading and mathematics scores were obtained by students in the daylight school buildings.

The average achievement score of the students were above 7% at the old school building without proper daylight but a 15% increment in achievement score was obtained when students were moved to building containing a properly integrated and managed daylighting buildings with an average increment of about 3% yearly.

Chapter Three

Case Studies

This chapter captures selected architecture building designs with the intent to garner useful techniques that can further inform the design of the proposed architecture faculty building of the Lead's City University. These case study sites were carefully selected with the intent of natural lighting in view. The four case study sites that will be appraised in this study are Umeå University School of Architecture, School of Architecture University of Waterloo, Department of Architecture, University of Lagos, Nigeria, and the Department of Architecture, YABATECH, Lagos, Nigeria

3.1 CASE STUDY 1 - Umeå University School of Architecture

The brief history about Umeå University School of Architecture indicate that it was found in 2009 as the fourth academic school located by Umeå River, Sweden to provide a professional degree in architecture. It is part of Umeå University. The Architectural Schools places a strong emphasis on integrated design and sustainable development, and aspires to become "an international laboratory of experimental architectural growth" (Umea school of architecture 2022).

The faculty building at the institution radiates with inventiveness and artistic experimentation because to its inner topography of open floor levels and sculpturally designed stairs (Figure 3.1). Building occupants will profit from the design structure once it is in place since it will serve as a foundation for creativity and innovation.

3.1.1 The design description

From the outside, the building has a cubic expression with its larch facades and square windows placed in a vibrant, rhythmic sequence on all sides. The interior space of the building is designed as a dynamic sequence of stairs and split, open floor levels where abstract, white boxes hang freely from the ceiling filtering the light coming in through the high skylights (Figure 3.2) The construction of a spacious, open learning atmosphere in which everyone is a part of the same room and is only divided by the split floors and glass walls of the teaching rooms was one of the main goals that guided the building's design. The layout encourages the students to share knowledge and ideas and makes it easier for them to be inspired by one another.

The drawing rooms, which are arranged along the building's façade in a precise and regular succession of columns and beams, have a straightforward and logical design in contrast to the vibrant atrium. In addition to producing a striking visual effect, the varied pattern of windows generously admits light into the structure and provides a breath-taking perspective of the river.

According to information from (Architects 2022), early energy calculations and daylight simulations helped determine that the facade should be made of wood with window holes rather than solely glass in order to achieve a reduction in energy of 50%.

The bearing structure cleverly incorporates ventilation, lighting, and heating functions. The air enters the building from the floor and is carried to the roof by the columns and beams, where it is circulated throughout the structure through perforated pipes.

Figure 3.1 Umea School of Architecture, Umea University

Figure 3.2 Interior showing natural lighting effect at the Umea School of Architecture, Umea University

3.2 CASE STUDY 2 - School of Architecture, University of waterloo

According to information gleaned from Wikipedia (Wikipedia 2021), the school relocated to an old manufacturing facility in Cambridge, Ontario, Canada in September 2004 in order to expand its facilities and boost the local economy. Levitt Goodman Architects was responsible for the building's design.

3.2.1 The design description

The design is based, in the words of Levitt Goodman Architects, on a procedure known as "excavation and intervention." By meticulously combining distinctive architectural components while preserving and highlighting the current building's distinctive character, this approach was intended to transform historic buildings.

A new, three-story atrium, connecting the street to the river and acting as a point of orientation for everyone entering the school, was cut out of the centre of the design. The main social and circulation hub where students and professors congregate is formed by two enormous steel steps that swing in the atrium area. The neighbouring ground-floor Lecture Hall was dug out of solid bedrock; the library, classrooms, and offices are on the second floor; and the studios and "loft" are on the top floor, where they have stunning views of the Grand River and the city of Cambridge. The pictures in Figures 3.3, 3.4, and 3.5 clearly demonstrate that the school's design included enough natural daylight.

Figure 3.3 School of Architecture, University of waterloo (External view)

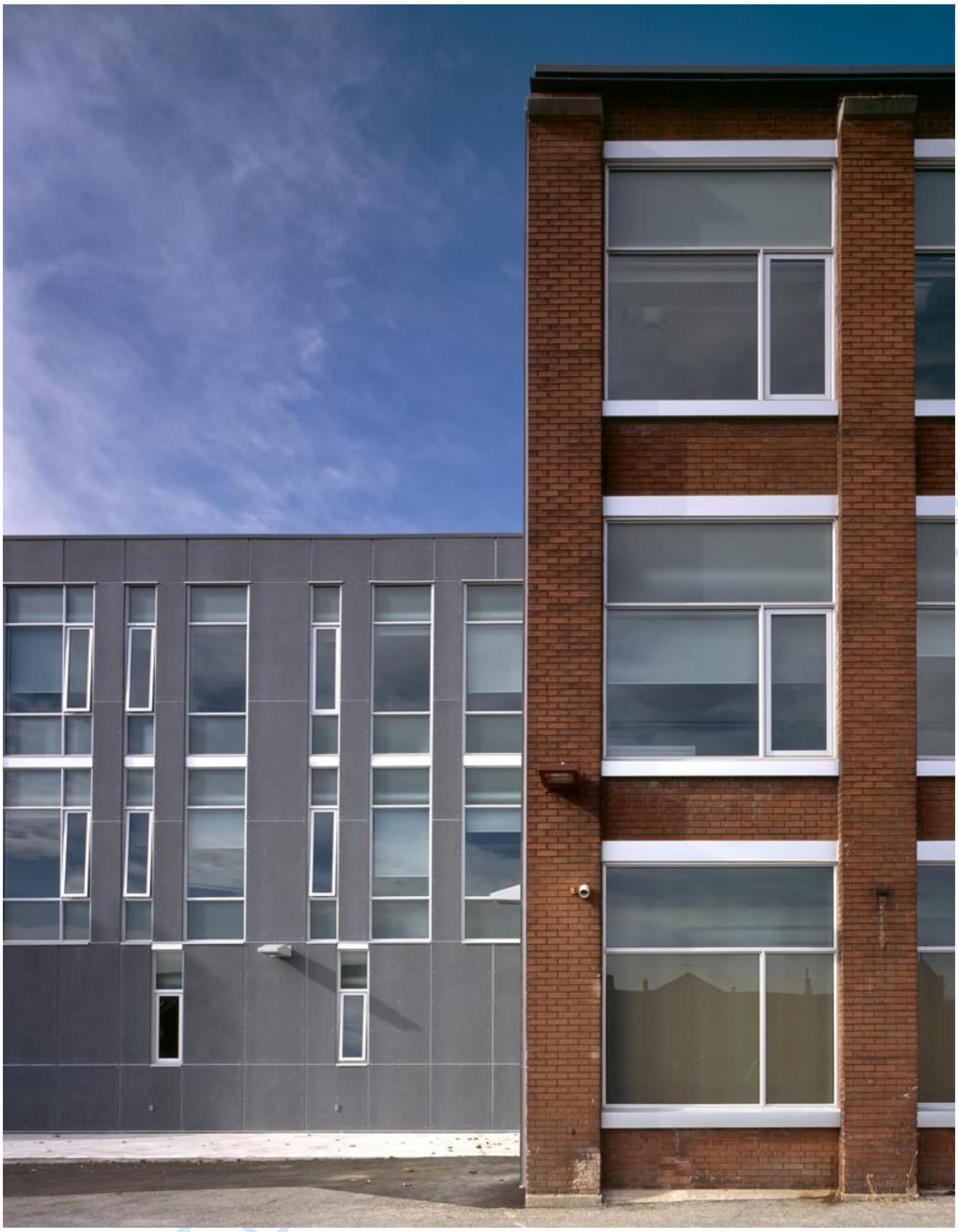


Figure 3.4 School of Architecture, University of waterloo (External view showing higher level window to aid natural lighting)

Figure 3.5 School of Architecture, University of waterloo (Interior view showing a building occupant enjoying the benefit natural lighting)

3.3 Case Study 3 – University of Lagos (UNILAG) Faculty of Architecture

The department of Architecture was introduced in 1980 under the Faculty of Environmental sciences. The building comprises the undergraduate studio and postgraduate studio (Figure 3.6 and 3.7). The exterior view of the departmental building was shown in Figure 3.8.

The undergraduate studio has a spatial dimension of 9mx9m sufficient to accommodate teaching and design activities. It was evident that the building is comprised of high-level windows around its perimeter wall which thus aid natural lighting and removes stale hot air from the space thus keeping it ever fresh. Also, the window type-louvre allows for inflow of air.

The postgraduate design studio, on the other hand, is 18m x 9m in size. In order to lessen sound resonance in the studio, carpet floor finish was chosen. It was noted that the classroom space was elevated vertically to a considerable degree, which discourages teamwork

The studio table were arranged horizontally along its long side which makes it hard for the students at the extreme ends (left and right) to participate fully.

It can be inferred that the horizontally oriented arrangement of the postgraduate studio reduces the full optimization of daylight into the spaces.

Figure 3.6 Undergraduate Design Studio of the Department of Architecture, UNILAG

Figure 3.7 Postgraduate Design Studio of the Department of Architecture, UNILA

Figure 3.8 Exterior view of the Department of Architecture, University of Lagos (UNILAG)

3.4 Case Study 4 – Department of Architecture, Yabatech

The undergraduate studio constructed for the Ordinary National Diploma of Yaba Technology have a spatial dimension of 18m x 9m. The design studio accommodates both teaching activities and studio design activities. The studio is densely populated with inadequate functional and circulation space. Also, the building has no high-level windows as such doesn't provide adequate natural lighting as shown in Figure 3.9.

The Higher National Diploma studio (Figure 3.10) has a spatial dimension of 9m x 9m, and it accommodates both teaching and studio design activities. The studio can be considered to have a reasonable natural lighting due to the high structure which allows sufficient reflection of the lighting.

Figure 3.9 Ordinary National Diploma Design Studio of the Department of Architecture, YABATECH

Figure 3.10 Higher National Diploma Design Studio of the Department of Architecture, Y

Chapter Four

Site Analysis and Design Synthesis

4.1 **Study Area**

4.1.1 The site of the proposed faculty of Architecture building for Leads City University will be located in the school premises in-between the boy's hostel and the faculty of Social sciences, Leads City University Ibadan, Oyo State. The entire zone is featured with flat topography.

Figure 4.1 : Site Location map

4.1.2 **Site selection criteria**

The efficiency and success of a conference centre also depend on the site being chosen with care, in addition to a functional design solution. When choosing the project's location, the following factors were generally taken into account. Site analysis is very crucial in the design process in respect to gathering enough information's during the site inventory that are to be carefully analysed to address all challenges that may affect the proposed design of the Faculty of Architecture. The existing features on the site and the adjoining properties must be properly investigated for effective and functional site planning.

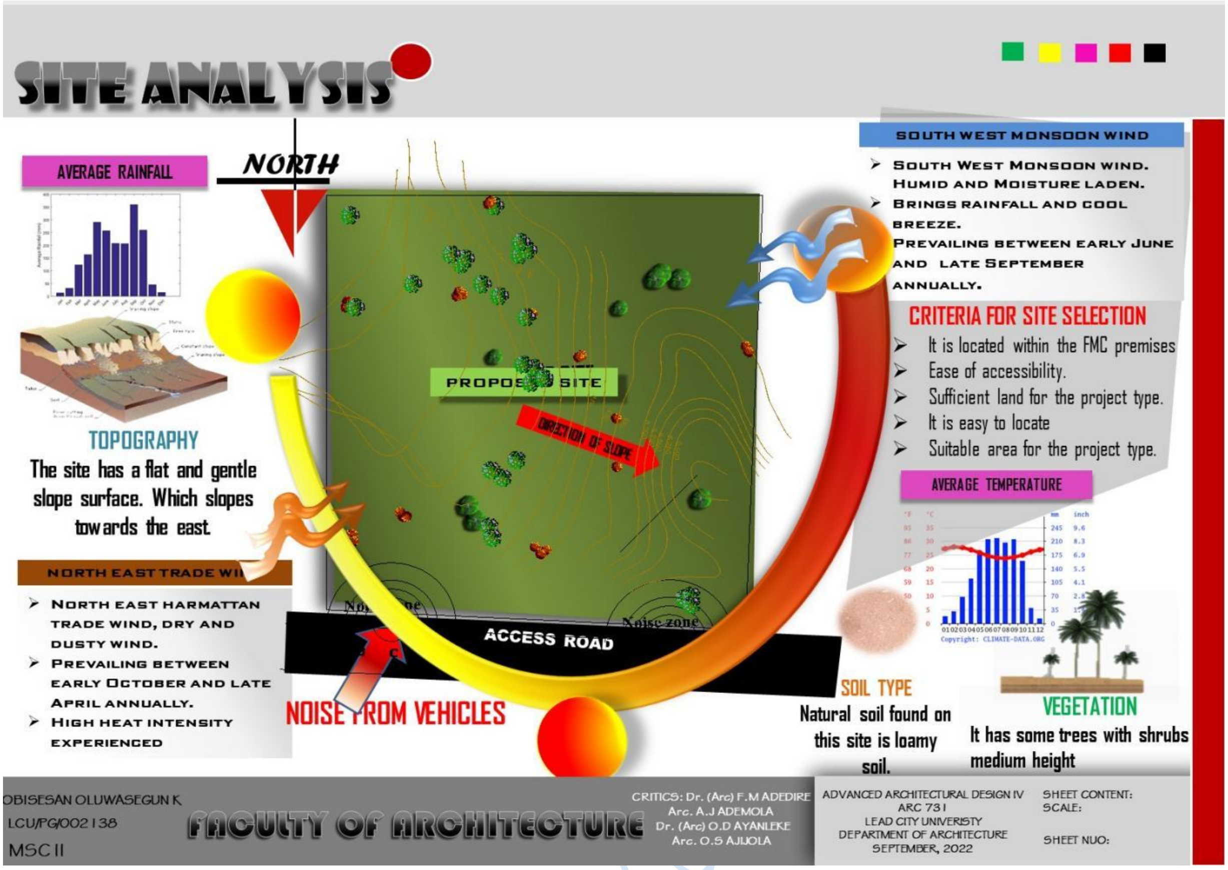


Figure 4.2: Site Analysis

The following conditions were considered primarily in the selection of the site project.

Accessibility: it can be accessed through the two major roads from the entry and the exit entrances into the school premises.

Availability of essential services and facilities: the services and facilities that must be considered in choosing the proposed site includes water ,electricity , good drainage system good road network and easy access to the site .the availability of these services and infrastructure will the burden of bringing them to the site which are very essential to the proposed facility.

The location of the site should have functional relationship with other facilities and activities of the university.

Parking facilities is considered for members of staff, visitors and students.

4.2 **Project analysis and Design synthesis**

4.2.1 **Brief Analysis**

Proposed Faculty of Architecture, Lead City University.

With the revision of the curriculum of Faculty of Environmental Studies and the directive given by the National University Commission, all Departments of Architecture in Nigerian Universities are compelled to upgrade their programmes to a Faculty of Architecture.

The responsibility has been given to us by the University Management to come up with a functional and economically viable proposal for the Faculty of Architecture.

In addition to the existing programme, the following programmes are to be incorporated from Undergraduate level to Postgraduate level:

i. **Interior Architecture**

Ii. Landscape Architecture

Iii. Industrial Architecture

Iv. Urban Design.

4.2.2 **Site Analysis**

Physical Features on The Proposed Site

1. Green trees and shrubs (Vegetation)
2. Favourable climatic conditions: Rainfall, Temperature variation, wind direction and sun pattern etc.

3. Soil condition which is rich in laterite.

Green Trees and Shrubs (Vegetation)

Vegetation on the site is dense, with trees, shrubs and grasses which covers the mass in an uneven proportion all over the site. With a careful examination and analysis of positioning of the proposed building on site, some of the trees will be brought down completely, while some will be retained and some will be replanted for specific use so as not to destroy the habitat of the site and to serve as wind breakers.

Soil Type

The proposed site has a good load bearing capacity with firm and stable soil rich with laterite.

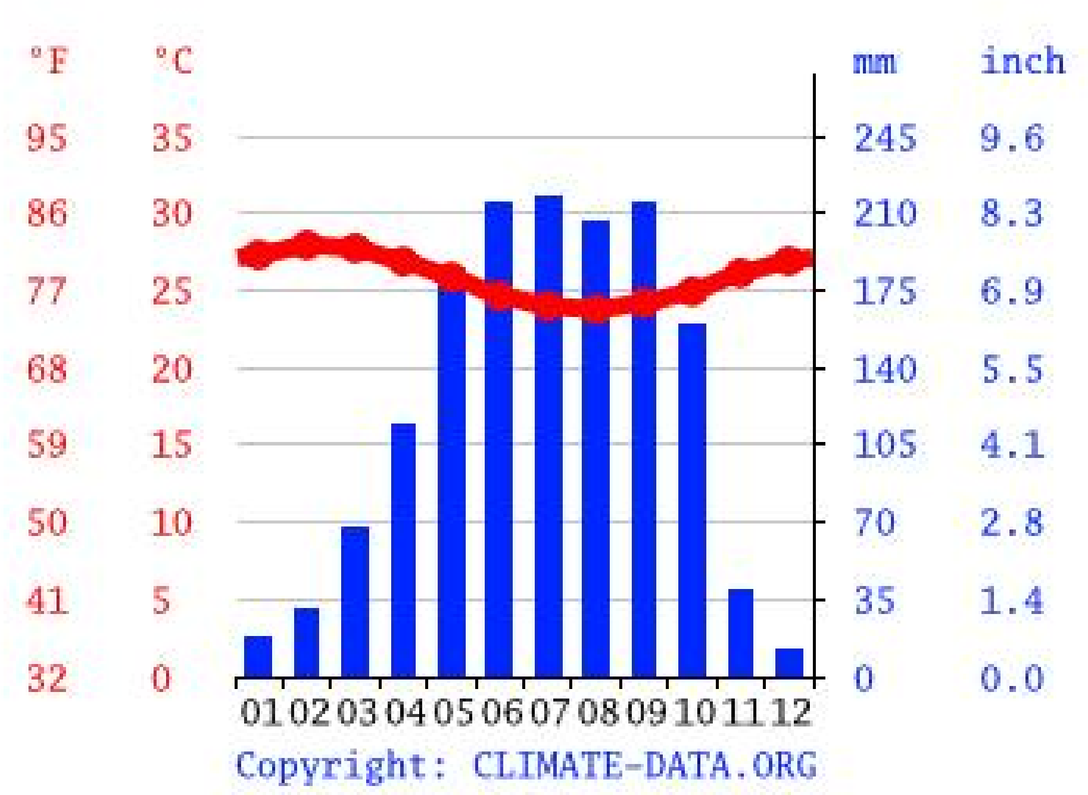
Climate

This is the general weather conditions found in a given place over time. The average weather condition of a particular place is experienced over a period of time is 35years. The major and important elements of climate to be considered for the effectiveness of the proposed project are rainfall, sunshine, relative humidity and temperature variation.

Rainfall

The sun, which is vertically overhead at the equator, results in the double maxima rainfall of April to October. The rainfall pattern of this region is that of the altitude of the midday sun.

Virtually rainfalls almost every day within these maxima months. However, the rainfall of this area, which is mainly conventional, is well distributed throughout the year, with barely any month without downpours.



Temperature Variation

Human response to net radiation is greatly influenced by air humidity. The dry season commences in November and terminates in March. Abuja records its highest temperature during the dry season, which is generally cloudless and characterized by low humidity, warm and dusty air. This consequently results in extreme temperature such as drastic temperature changes as much as 28^{0}c could be recorded in a day. The rainy season is characterized by high humidity due to the dense cloud cover, causing the maximum and minimum temperature to drop to about 32^{0}c. These significant temperature variations call for some considerations in the design process especially in the pattern of fenestration and choice of materials. Thermal comfort can be maintained with the use of materials of high thermal conductivity due to their less heat condition across the building fabric. Fenestration should be such as would allow a larger surface to be opened during the dry season and vice versa during wet season.

Solar Radiation

The average sunshine hours during the dry months of November to March are between 9-12 hours. This duration of sunshine hours plays a crucial role in design. The building should be oriented in such a way that the shorter axis faces the east-west direction. Shading devices are to be such as would minimize the undesirable effect of solar radiation. Trees, shrubs and lawns will be provided to further cushion the effect of solar radiation thus improving the thermal comfort in the building.

Prevailing Wind

The North-East trade wind and the South-west monsoon wind are the two prevailing winds that dominate Abuja. The North-East wind is characteristically dusty and dry, light and with high velocity, it is prevalent during the dry season. This proposed design would therefore minimize the effects of these undesirable features by minimizing the openings in the North-east direction and by orienting the building so as to reduce the effect of the wind pressure. This can also be reduced by the use of wind breakers in form hedges and trees. The other prevalent wind can be optimized by providing large fenestrations and orienting the building in this direction, so as to maximize its cooling effect.

4.2.3 **Design Criteria**

There are several factors considered during the design process of the proposed faculty of Architecture. These factors are however grouped into two headings.

Environmental considerations

There are many environmental factors affecting human being. These factors may be other living biotic factors or abiotic factors, such as temperature, rainfall, day length, wind, and ocean currents. Thus, it is necessary to explore those qualities that can help ensure users comfort, protection and other performance requirements of a building:

- **Site organization**: a proper usage of spaces available on the site and planning of the site is necessary. The proper distinction in various forms of landscape hard and soft is needed. Pedestrian walkways need to be distinguished from vehicular paths.
- **Site Zoning**: zoning entails the effective organization and functional disposition of the available area on the site for specific functions. The orientation of the building and the building type, the topography, available service, future expansion, and other physical information are examined altogether to evolve a functional site.
- **Orientation:** Orientation for optional breeze is the best position of the proposed design in relation to wind direction for maximum average indoor air velocity. Although the highest windward pressure is generated when the façade is perpendicular to wind direction, it has been shown experimentally that when the façade is at 45° to the wind direction, maximum average indoor air movement occurs, even though pressure at the windward end of the window is not at maximum. Better orientation conditions will be achieved in this proposed museum when the air stream has to change direction inside the room than when the flow is direct from inlet to outlet.
- **Ventilation:** Proper ventilation is the supply of fresh air to and the expulsion of state air from a physically enclosed space. Air exchange resulting from ventilation improves the cooling effect of the space. This is necessary for room comfort, especially in hot-humid climates. Ventilation for this design will be achieved both artificially and naturally.

Artificial Ventilation: Artificial or mechanical ventilation will be achieved by the use of mechanical equipment's to achieve and control air exchange; fans, air conditioners etc are examples of such equipment. Air conditioners will simultaneously control temperature, humidity, air purity and movement at desired levels to ensure comfort.

Natural Ventilation: This does not rely on any mechanical power but on natural movement resulting in air exchange between the air in the interior space and fresh air from outside. The factors that influence the natural ventilation include; Vegetation, which will be adopted by providing it near the building, this will have a considerable influence on the micro-climate. Trees, shrubs and other plantings would be employed in cutting down solar radiation, glare and dust. The green areas will be used to ensure that air channelled into the openings is cool. However, it must be ensured that the presences of vegetation like tall trees do not obstruct airflow and that the proximity does not affect the structure in anyway. Another factor that affects natural ventilation is Fenestrations; which gives the effective flow of air from windward to the leeward side of a building, is only possible if there are openings in both sides. The position of openings in the proposed building will be such that it will encourage air movement throughout the depth of spaces. Floor to ceiling concentration of flow will be at a level that suits the function of the space.

- **Lighting:** Lighting is a very important environmental design consideration because it is only under light that architecture and its content can be experienced, and this will be done artificially and naturally.

Artificial Lighting: Lighting through the use of filament bulbs, Incandescent lamps and fluorescent tubes are some of the means by which lighting will be provided in the building. They make for more pre-determined control of illumination according to the nature and function of spaces being lit. Generating, artificial lighting for this design will be required to:

- Light the building at night,
- Supplement day lighting, when necessary,
- Provide special lighting on difficult visual tasks,
- Maintain attention on work,
- Ensure safety and alertness

Natural Lighting: The source of daylight is a reflection from the sky although part of the natural lighting comes from reflections from nearby facades, atrium and surfaces. In this project, natural lighting, as much as possible will be enhanced and be looked into specifically to achieve the best with light coming into the building naturally from the sky, but artificial means will also be employed .in specialized lighting of peculiar spaces especially in the workshops where the efficiency of visual work cannot be left to chance. In situations of glare, where inadequate illumination causes eye straining and discomfort, excessive light results in glare and dazzle, a discomfort of a different kind. Vegetation cover will be efficiently used to cut down the likely effect of glare due to day lighting. The interior spaces will be properly designed to reduce contrast between external lighting from sky and lighting of the interior thus avoiding the dazzling effects.

Experiments suggest that horizontal glazing placed immediately above the working plane of a large working area provides the best solution to lighting. Research also shows that roof top lighting is the most economical way of obtaining a high level of daylight over a large area; therefore, sky lighting will be used in the proposed design.

For flexibility in use, the proposed building will be designed with more than the minimum lighting capacity, especially in exhibition spaces. Lighting needs and system will vary by the function of the space and type of display.

- **Acoustics:** The need to insulate buildings against noise from both faculty building and the boy's hostel alongside with other sources of noise is necessary. In most cases, the acoustics of a space will be satisfactory if a proper balance between sound-absorbing and sound reflecting materials is created.

Acoustics in all spaces must be comfortable for individuals and groups. It is important for lecturers are to be heard by their students without disturbing other studios or lecture classes. Some spaces and functions such as conference rooms, lecture rooms, auditorium, must be designed by specialist. Therefore, attention shall be given to elimination of interference of sound in building.

- **Circulation:** good circulation (both vehicular and pedestrian) enhances site organization. Some areas on the site are prohibitive, efficient circulation system will control movement away from such places.

End Users Considerations

The users of the building are taken into consideration. The building caters for the different cadres of people from the children to the adults and the old people. The building also includes facilities for disable people both at the exterior and interior of the building by providing ramps at strategic parts of the building. The building is designed for the people and not the people for the building so the building must be design in such way that the users are the factors that determine the allocation of spaces in an inclusive approach to design from the planning stage of the proposed design.

4.2.4 **Conceptual Development**

The design philosophy for the proposed faculty of Architecture is aimed at using character letters in combining letters to achieve a form. letters F and A was combined together to achieve a form for the proposed building.

Faculty **A**rchitecture

4.2.5 Functional Relationship

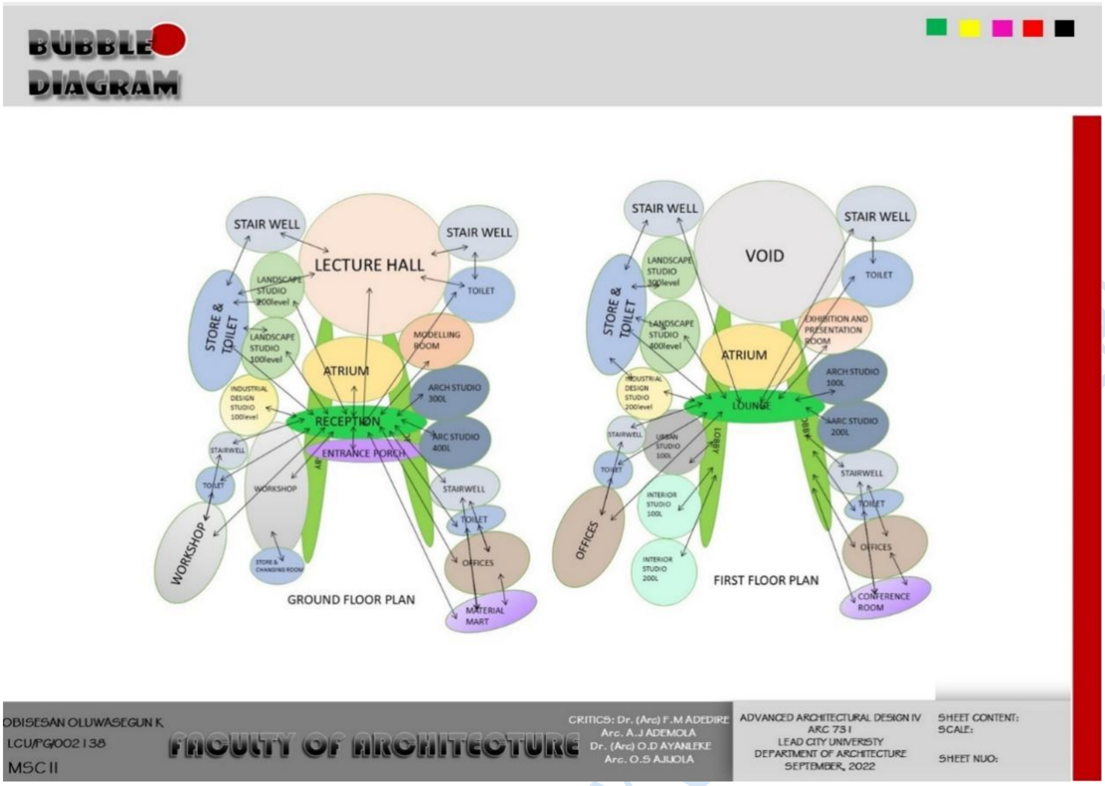


Figure 4.3: Bubble diagram

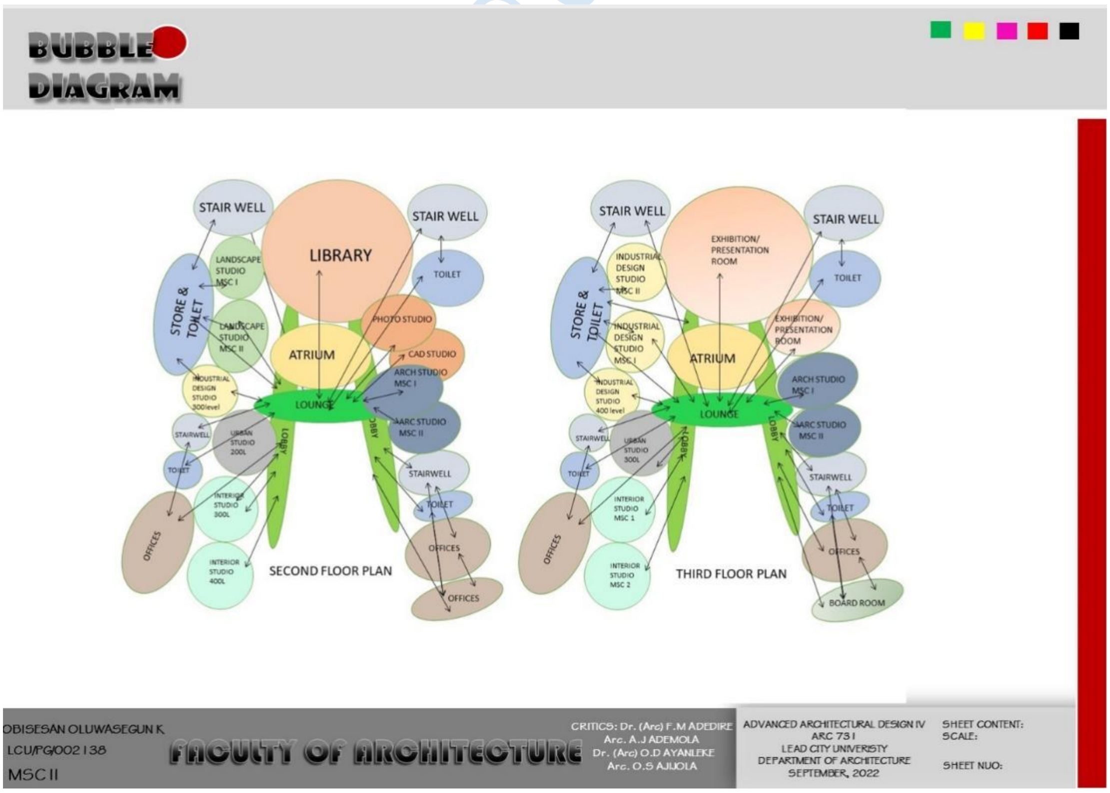


Figure 4.4 Bubble diagram

4.2.6 **Space Allocation**

SPACES	AREA (SqM)
ENTRANCE	92.48
RECEPTION	131.93
ATRIUM	77.51
LECTURE HALL	141.54
ARCH SUDIO 100L	103.94
ARCH STUDIO 200L	106.45
ARCH STUDIO 300L	106.44
ARCH STUDIO 400L	106.45
ARC STUDIO MSC 1	106.44
ARCH STUDIO MSC 2	106.45
LANDSCPAPE STUDIO 100L	91.33
LANDSCPAPE STUDIO 200L	82.16
LANDSCPAPE STUDIO 300L	82.16
LANDSCPAPE STUDIO 400L	91.33
LANDSCPAPE STUDIO MSC 1	82.16
LANDSCPAPE STUDIO MSC 2	91.33
LIBRARY	152.72
EXHIBITION/PRESENTATION ROOM	113.71

Table 4.1 Space allocation

SPACES	AREA (SqM)
INDUSTRIAL DESIGN STUDIO 1OOL	149.63
INDUSTRIAL DESIGN STUDIO 200L	149.63
INDUSTRIAL DESIGN STUDIO 300L	149.63
INDUSTRIAL DESIGN STUDIO 400L	149.63
INDUSTRIAL DESIGN STUDIO MSC 1	91.33
INDUSTRIAL DESIGN STUDIO MSC 2	82.16
URBAN STUDIO 100L	75.13
URBAN STUDIO 200L	75.13
URBAN STUDIO 300L	75.54
URBAN STUDIO 400L	75.54
URBAN STUDIO MSC 1	75.13
URBAN STUDIO MSC 2	
INTERIOR STUDIO 100L	75.50
INTERIOR STUDIO 200L	77.35
INTERIOR STUDIO 300L	75.50
INTERIOR STUDIO 400L	77.35
INTERIOR STUDIO MSC 1	75.50
INTERIOR STUDIO MSC 2	

Figure 4.2 Space allocation

SPACES	AREA (SqM)
DEAN'S OFFICE	34.68
BOARD ROOM	38.96
CONFERENCE ROOM	53.89
MATERIAL MART	53.89
WORKSHOP 1	191.45
WORKSHOP 2	150.96
OFFICES 1	11.84
HOD'S OFFICE	20.83
OFFICES 2	10.57
FEMALE TOILET (RIGHT)	22.09
MALE TOILET (RIGHT)	30.12
TOILET 1 (LEFT)	30.73
TOILET 2 (LEFT)	26.00
CHANGING ROOM 1	8.10
CHANGING ROOM 2	17.19
HOD OFFICE 2	21.56
VIRTUAL ROOM	36.81
EXHIBITION/PRESENTATION ROOM (octagonal)	192.97

Figure 4.3 Space allocation

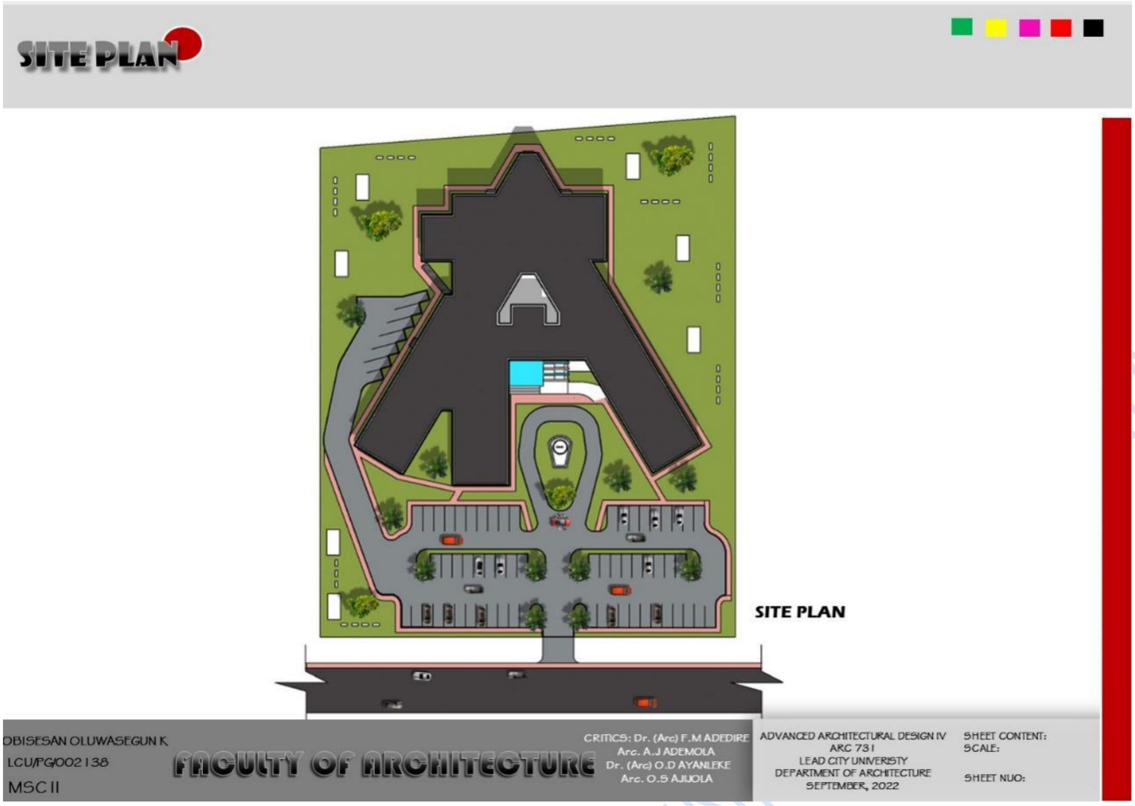


Figure 4.5 Site plan

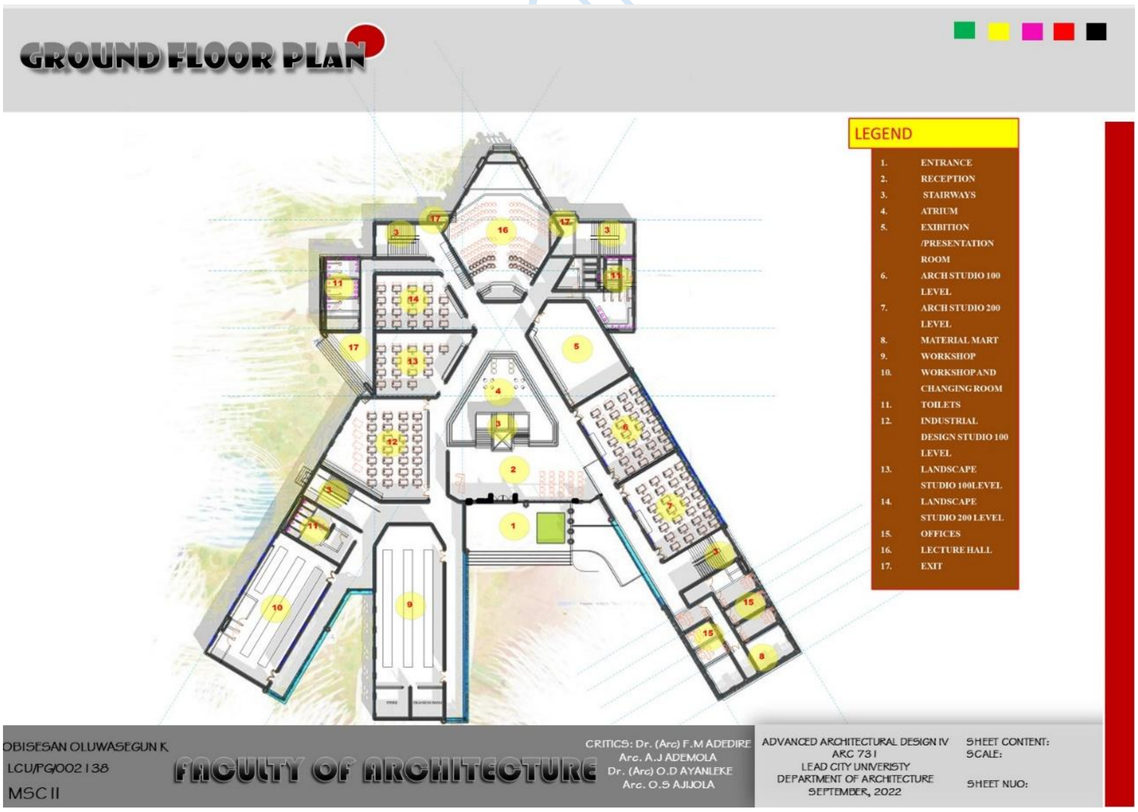


Figure 4.6 Ground floor plan

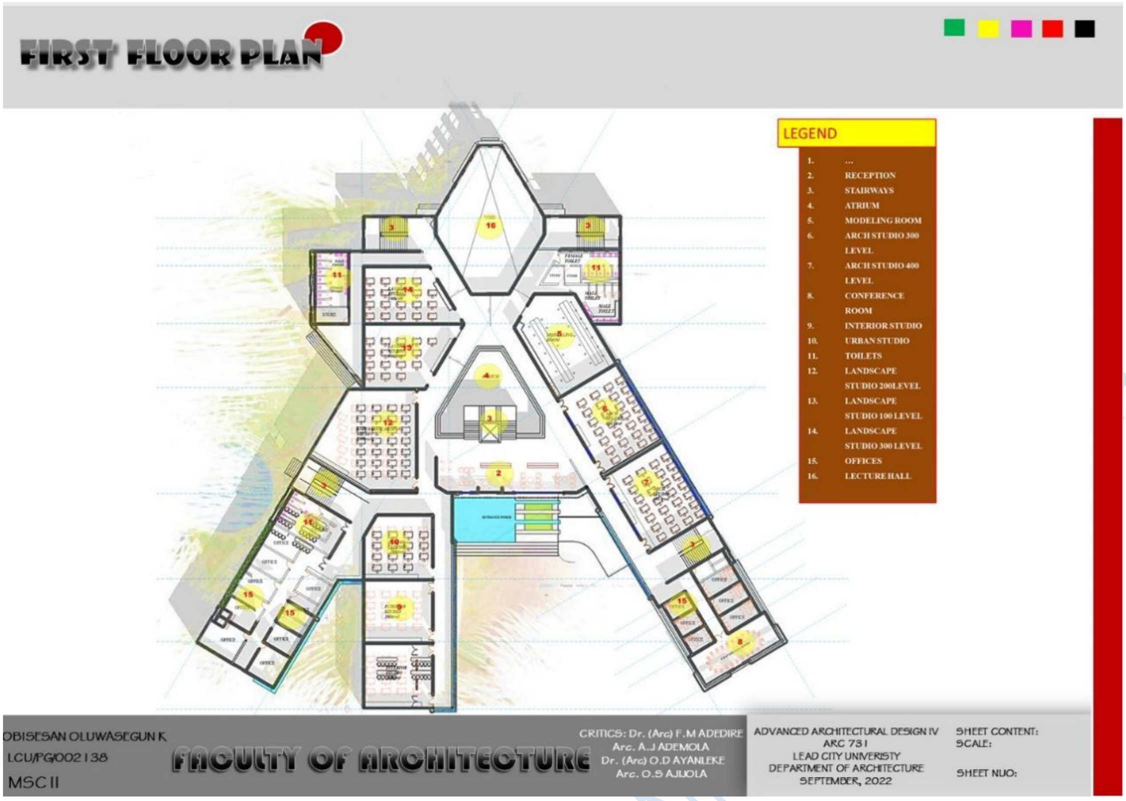


Figure 4.7 First floor plan

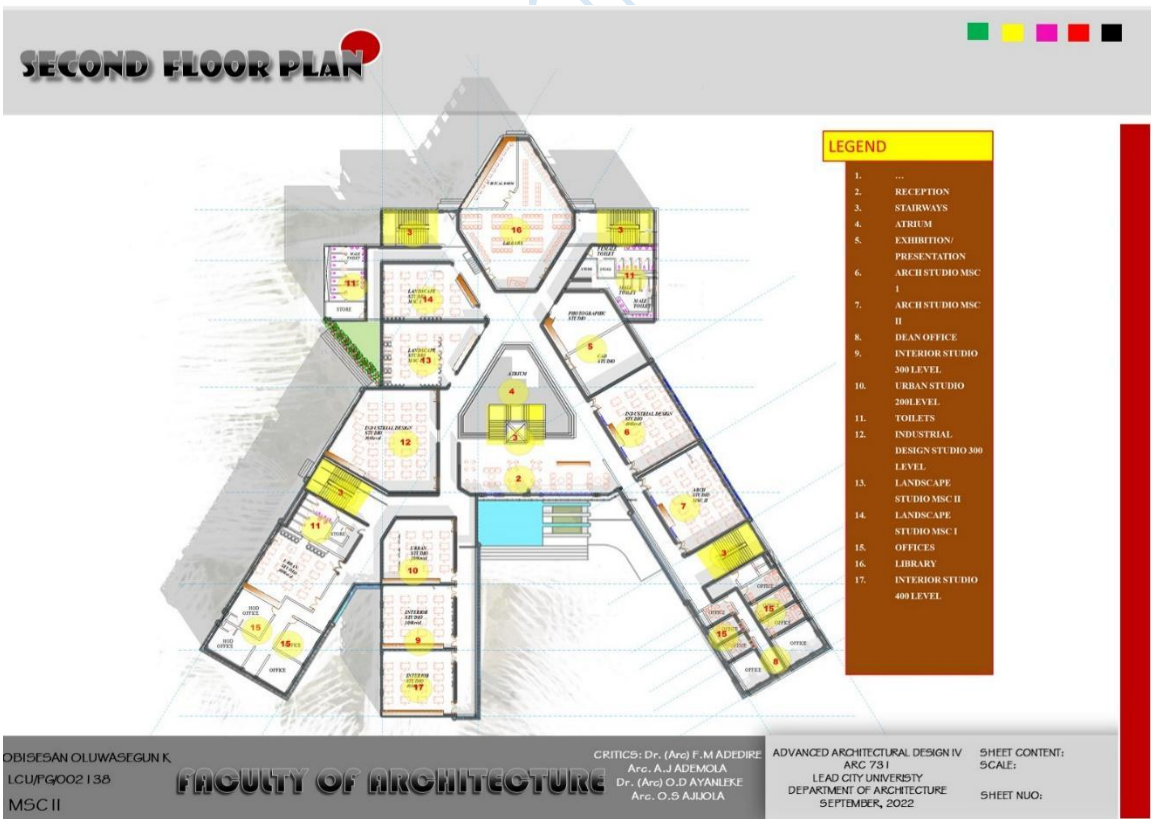


Figure 4.8 Second floor plan

Figure 4.9 Third floor plan

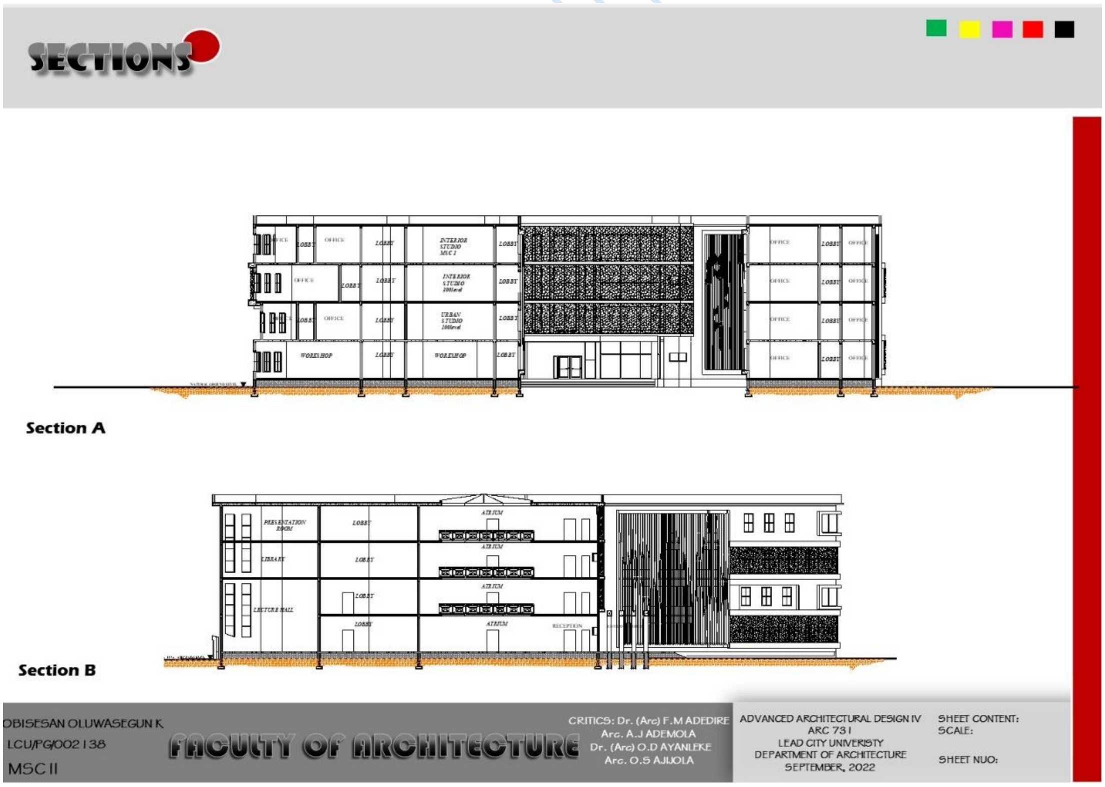


Figure 4.10 Sections

Figure 4.11 Elevations

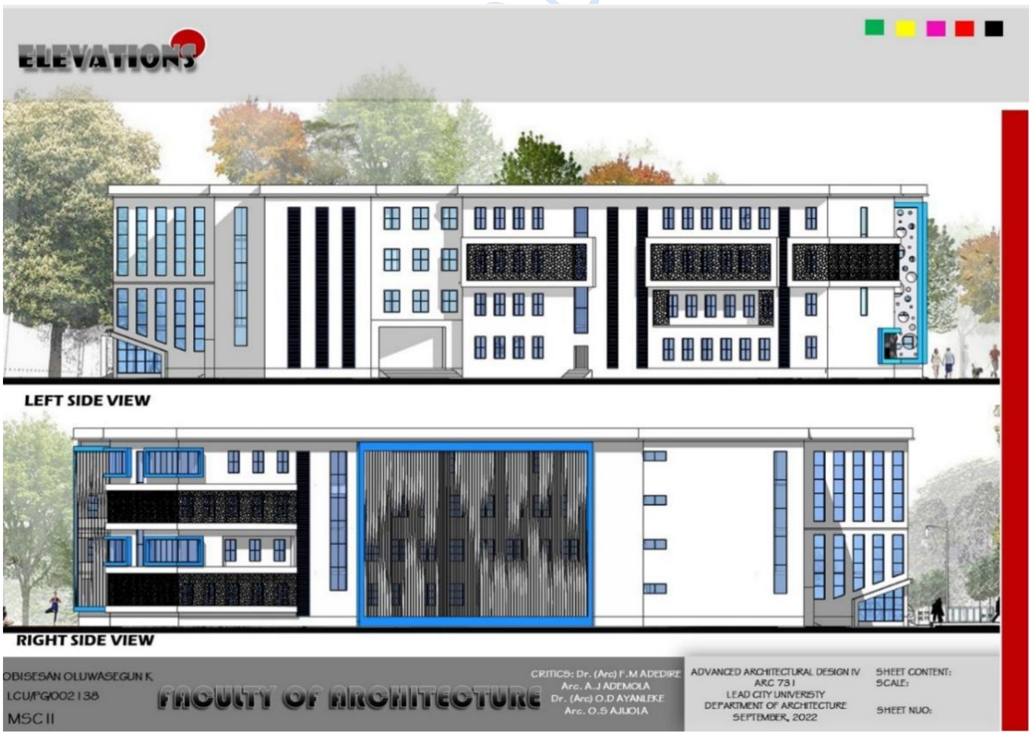


Figure 4.12 Elevations

Figure 4.13 3 Dimensional drawings

Figure 4.14   3 Dimensional drawings

4.2.7 **Construction Methods and Materials**

The following building materials will be used mostly on the building exterior/envelope. It is however not exhaustive of the following wood, bricks, concrete, steel, claddings and skin walls.

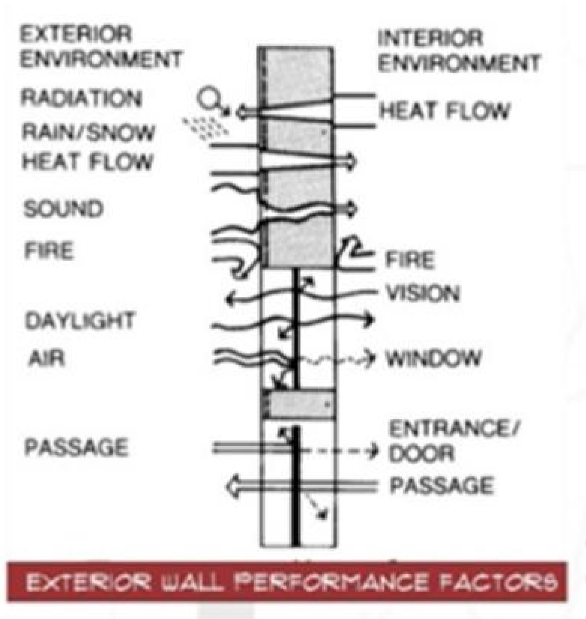


Figure 4.15 Exterior wall performance factors

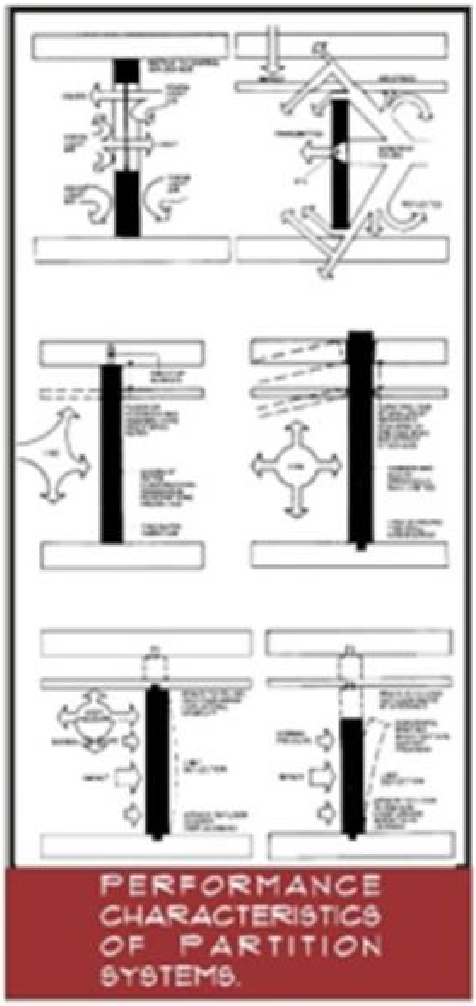
Interior Partition Systems

Partitions can be used to separate places as well as to obstruct visibility, sound, or fire. Lightweight partitions, like drywall, are easy to transport and can be fixed or demountable. The slab will be supported by blocks or brick partitions, some of which may also be load bearing.

It is crucial to distinguish between the performance of a single panel (which may be high) and the wall (including) door and apertures as a whole when it comes to sound and fire insulation.

Including with furniture, factors like design calibre, robustness, delivery, continuous availability, range, and cost must all be taken into account. The same concerns must be taken into account when installing mobile partitions in conference rooms and auditorium.

Additionally, special attention must be paid to support and storage methods as well as acoustic performance, which may necessitate adding PNEUMATIC SEALS to the joints or



an equivalent.

Figure 4.16 performance characteristics of portioning systems

Floor Systems

Popularity of these slabs' ranges from 1 to 10 meters. They combine the benefits of both waffle slabs and level soffits. With toppings between 50 and 150mm thick, standard moulds with depths of 225, 235, and 425mm are employed. A 900mm grid has ribs that are 125mm broad. Because beam deflection determines depth, they are typically highly strengthened. Internal beams must be at least 962mm (one waffle) plus two times the width of the column. They account for a 10kn/m edge loading in their calculations.

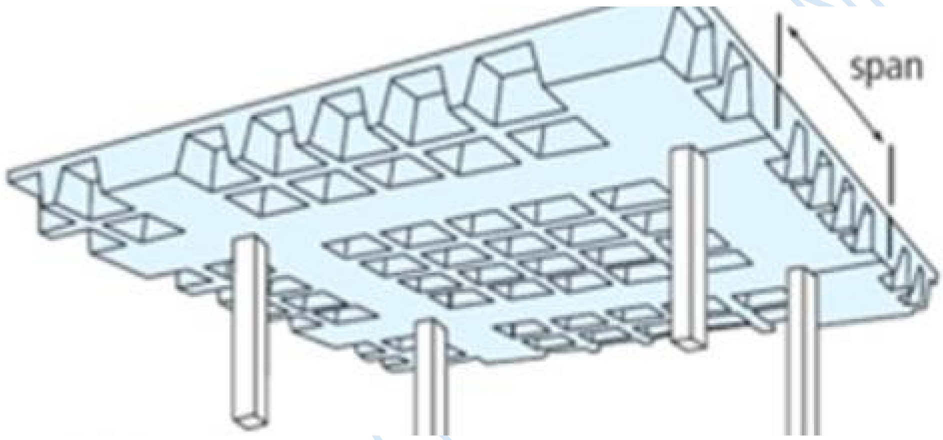


Figure 4.17 floor system

Roof Systems

Warm flat roof construction is to be used and adopted in some areas for either roofing or roof deck of some parts of the building. The purpose of a warm roof is to place the isolation below the waterproofing membrane, which helps to protect the reinforced concrete roof slab from extreme temperature variations.

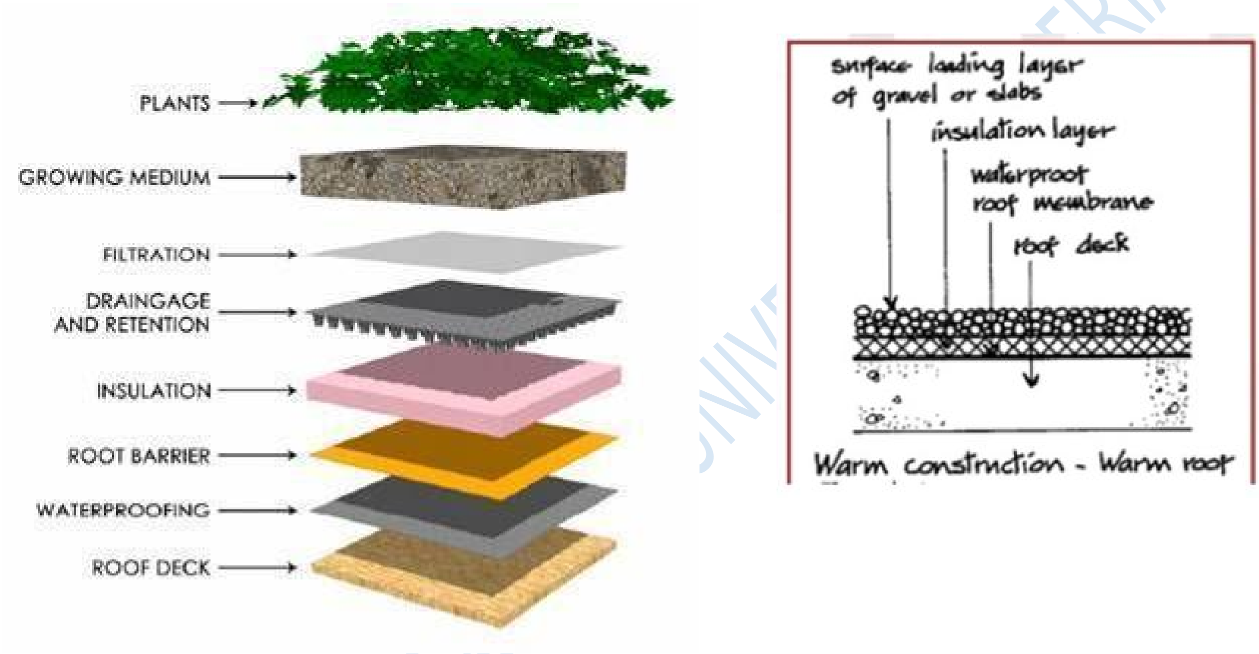


Figure 4.18 performance characteristics of portioning systems

Fire Control/Prevention Systems

There must be Strategic positioning of fire escape stair cases and routes around the proposed building.

On site muster points in case of fire outbreak in the building.

Active fire extinguisher installations are used to prevent the spread of fire by detecting and/or containing fire in its early phases.

Limiting the spread of fire by compartmentalizing spaces, maintaining them by protecting openings, and putting out fires in hidden spaces.

Solar Control Windows

The glass used for the building's windows must be able to shield the interior of the structure for optimum comfort, minimal energy use, assurance of safety, and last but not least, provide the optical and aesthetic features that satisfy the designer.

Glass can be advantageous in the winter because it lets light and heat into the building, but in the summer, without solar management, it can get uncomfortable hot. By decreasing or eliminating the need for air conditioning, solar control glass creates a more comfortable environment while also helping to lower a building's initial investment, ongoing operating expenses, and carbon emissions.

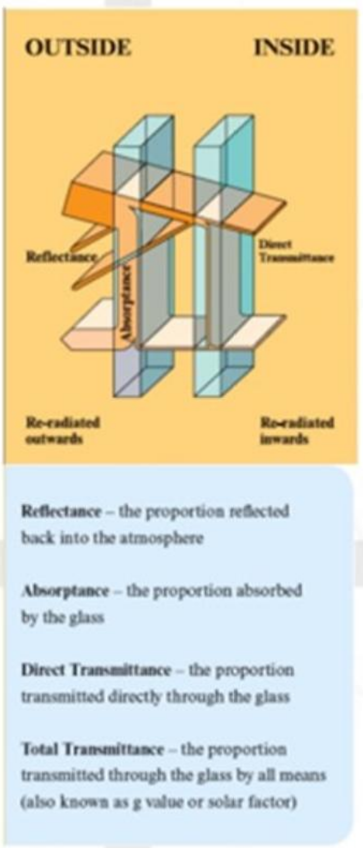


Figure 4.18 performance characteristics of portioning system

Chapter Five

Conclusion

5.1 Project Appraisal

This project work investigated the concept of natural lighting in the design of selected international and National Architecture faculty buildings. It was observed that Architectural faculty buildings have integrated designs that aimed to grow into "an international laboratory of experimental architectural development. They were also embedded in creativity and artistic values. The buildings allowed for the development of an airy, light-filled study space where everyone could be in the same room at once. They also enabled student collaboration, inspiration from one another, and the sharing of information and ideas.

Additionally, window pattern designs encourage the flow of natural light. For one of the case studies, perforated pipes were used to circulate the air throughout the structure by passing it underneath the floor and up the columns and beams to the top.

It was noticed that reliance on artificial lighting was minimal in the case studies investigated in this work

In order to replicate the information retrieved in these case studies on the design of Architecture Faculty building of the Lead's City University, I incorporated a natural lighting with minimal reliance on artificial lighting source. Sky lighting would be tapped through the use of a patterned window design and a roof top lighting to obtain a high level of daylight in the proposed building design. Furthermore, lighting needs and system will vary by the function of the space and type of display.

5.2 Conclusion

The natural lighting in the design of selected Architecture Faculty buildings was investigated and the Architecture Faculty design was successfully proposed in this project work. Based on the findings, it can be inferred that the international architecture buildings had adequate natural lighting features owing to the inclusion of sufficient window and high-level building. On the other, spacing and position of windows inhibited adequate natural lighting of the case study buildings considered in Nigeria. Hence, building occupants of case study 1 and 2 enjoys more benefits of natural lighting. Upon the completion of the appraisal, some useful information garnered were considered in the design of the proposed Faculty of Architecture building, Leads City University were noted. The inclusion of sufficient patterned windows and roof top lighting contributed immensely to the proposed faculty building design to ensuring it has adequate natural lighting.

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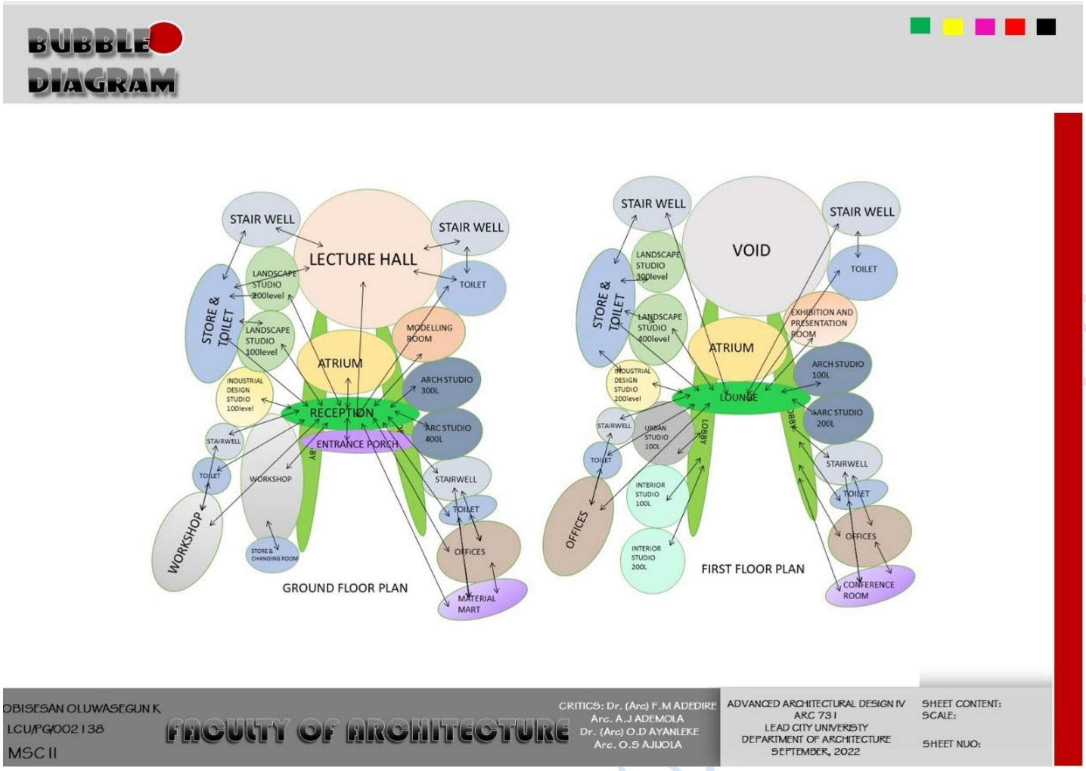
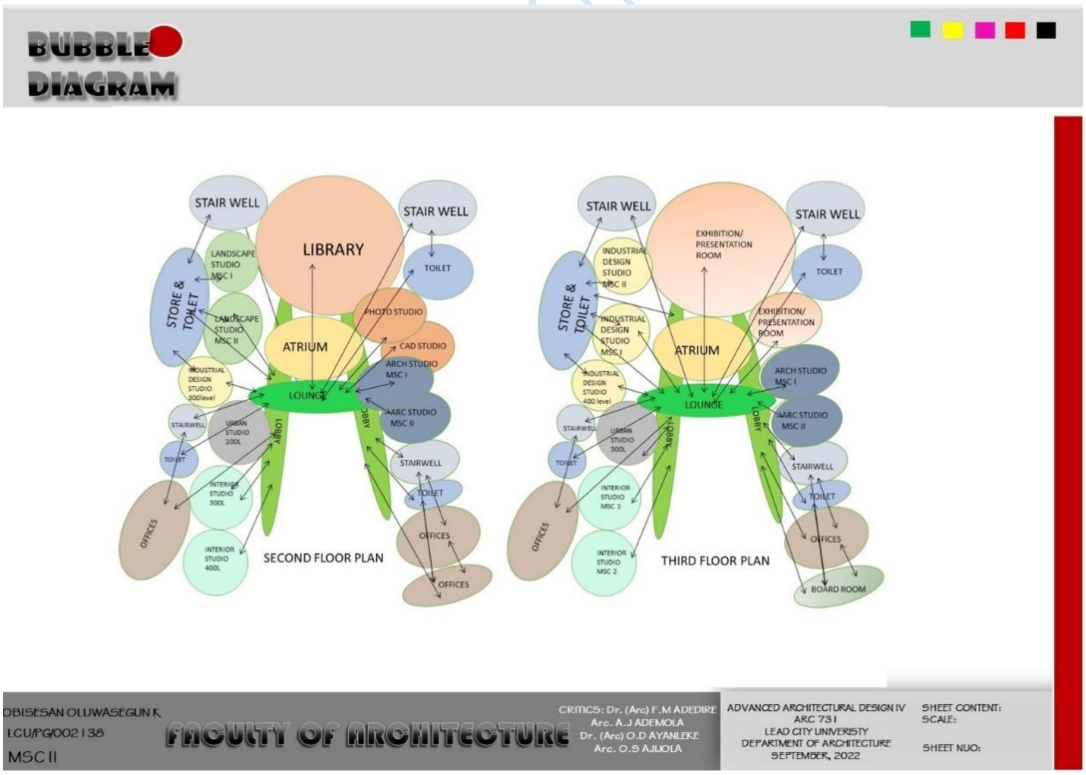
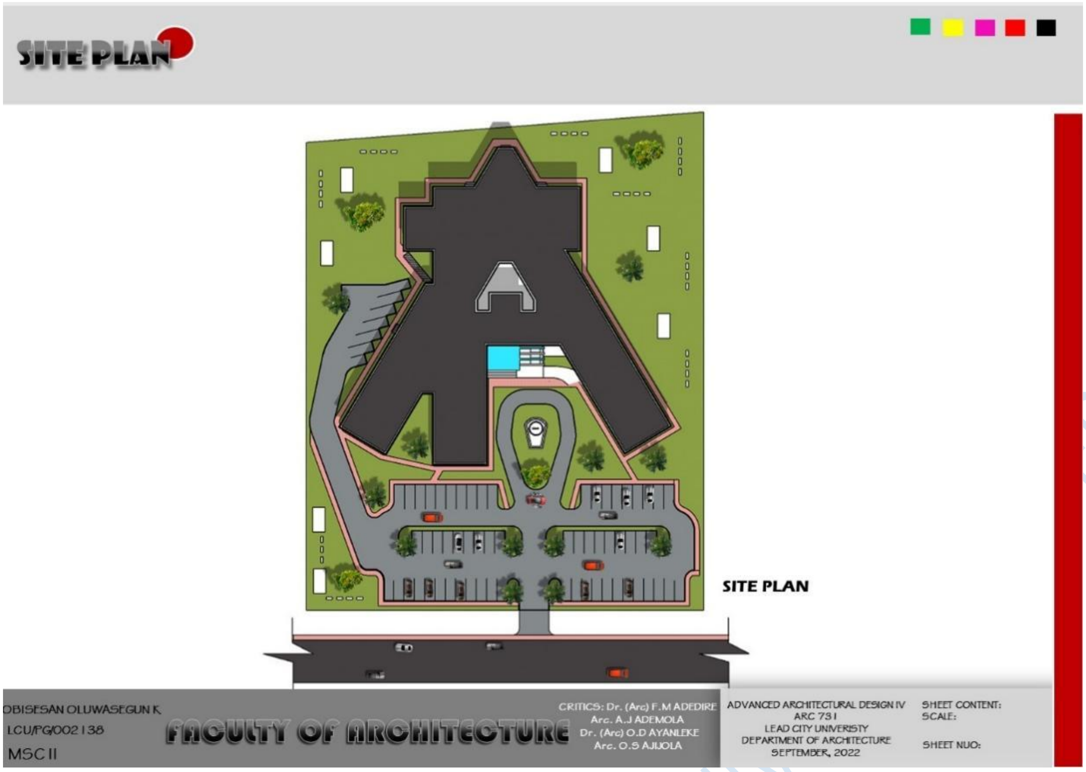
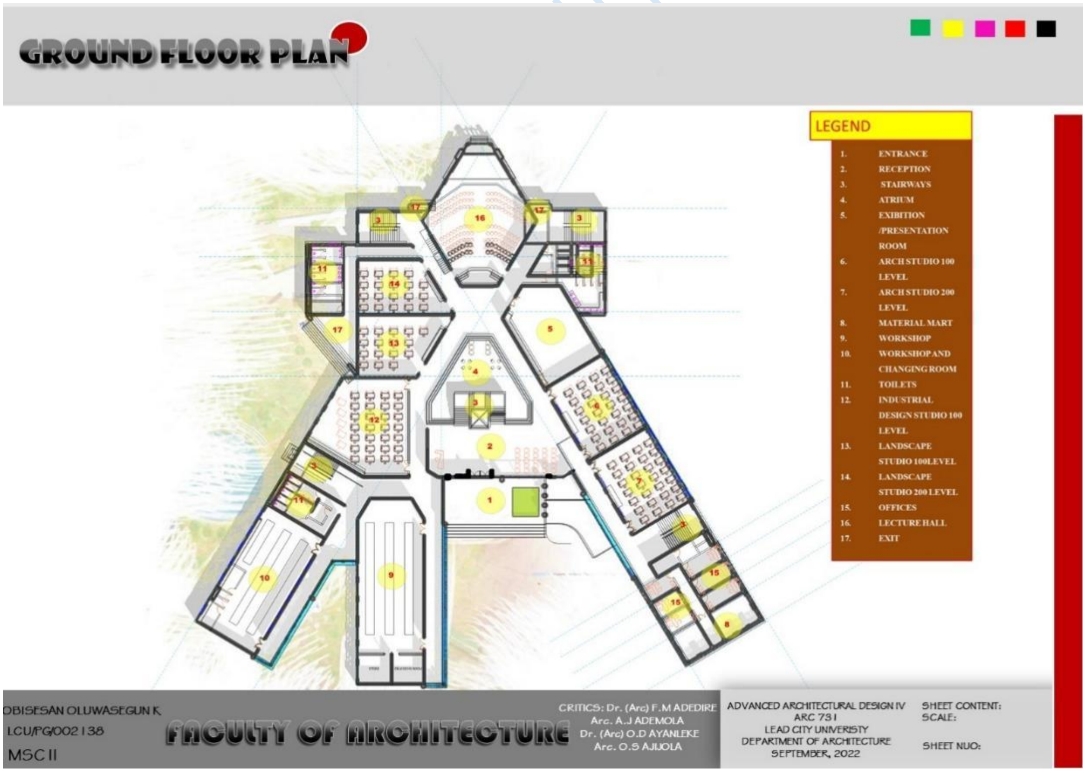
Appendix I (Presentation Drawings)






SITE PLAN
SITE PLAN
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERSITY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
SHEET CONTENT:
SCALE:
SHEET NUO: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LEGEND
1. ENTRANCE
2. RECEPTION
3. STAIRWAYS
4. ATRIUM
5. EXIBITION /PRESENTATION ROOM
6. ARCH STUDIO 100 LEVEL
7. ARCH STUDIO 200 LEVEL
8. MATERIAL MART
9. WORKSHOP
10. WORKSHOP AND CHANGING ROOM
11. TOILETS
12. INDUSTRIAL DESIGN STUDIO 100 LEVEL
13. LANDSCAPE STUDIO 100LEVEL
14. LANDSCAPE STUDIO 200 LEVEL
15. OFFICES
16. LECTURE HALL
17. EXIT
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERSITY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
SHEET CONTENT:
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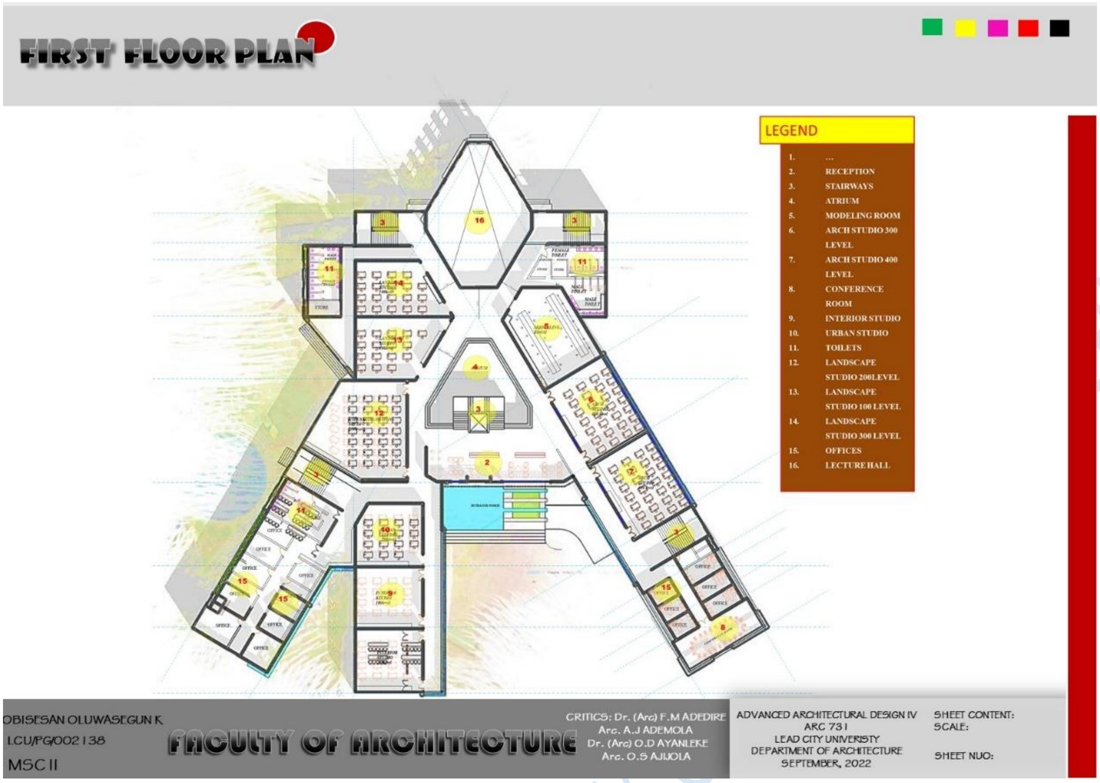
FIRST FLOOR PLAN
LEGEND
1. ...
2. RECEPTION
3. STAIRWAYS
4. ATRIUM
5. MODELING ROOM
6. ARCH STUDIO 300 LEVEL
7. ARCH STUDIO 400 LEVEL
8. CONFERENCE ROOM
9. INTERIOR STUDIO
10. URBAN STUDIO
11. TOILETS
12. LANDSCAPE STUDIO 200LEVEL
13. LANDSCAPE STUDIO 100 LEVEL
14. LANDSCAPE STUDIO 300 LEVEL
15. OFFICES
16. LECTURE HALL
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERISTY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
SHEET CONTENT:
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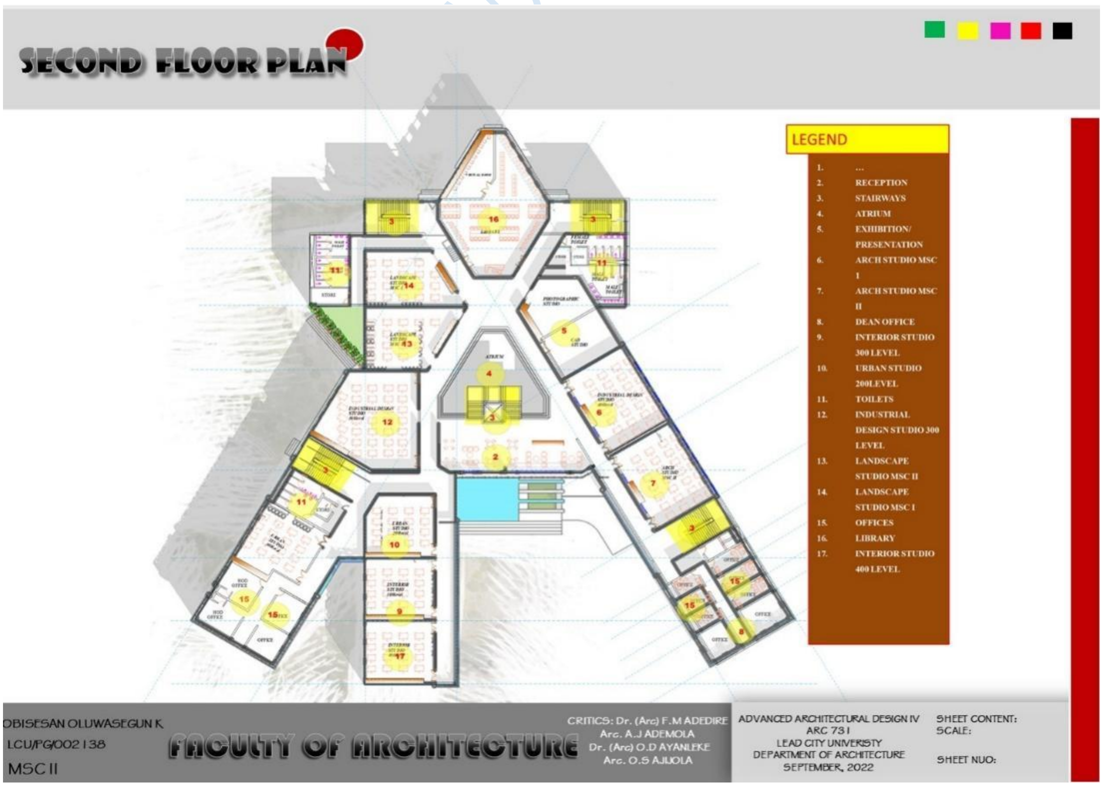
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LEGEND
1. ...
2. RECEPTION
3. STAIRWAYS
4. ATRIUM
5. EXHIBITION/ PRESENTATION
6. ARCH STUDIO MSC 1
7. ARCH STUDIO MSC II
8. DEAN OFFICE
9. INTERIOR STUDIO 300 LEVEL
10. URBAN STUDIO 200LEVEL
11. TOILETS
12. INDUSTRIAL DESIGN STUDIO 300 LEVEL
13. LANDSCAPE STUDIO MSC II
14. LANDSCAPE STUDIO MSC I
15. OFFICES
16. LIBRARY
17. INTERIOR STUDIO 400 LEVEL
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERISTY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
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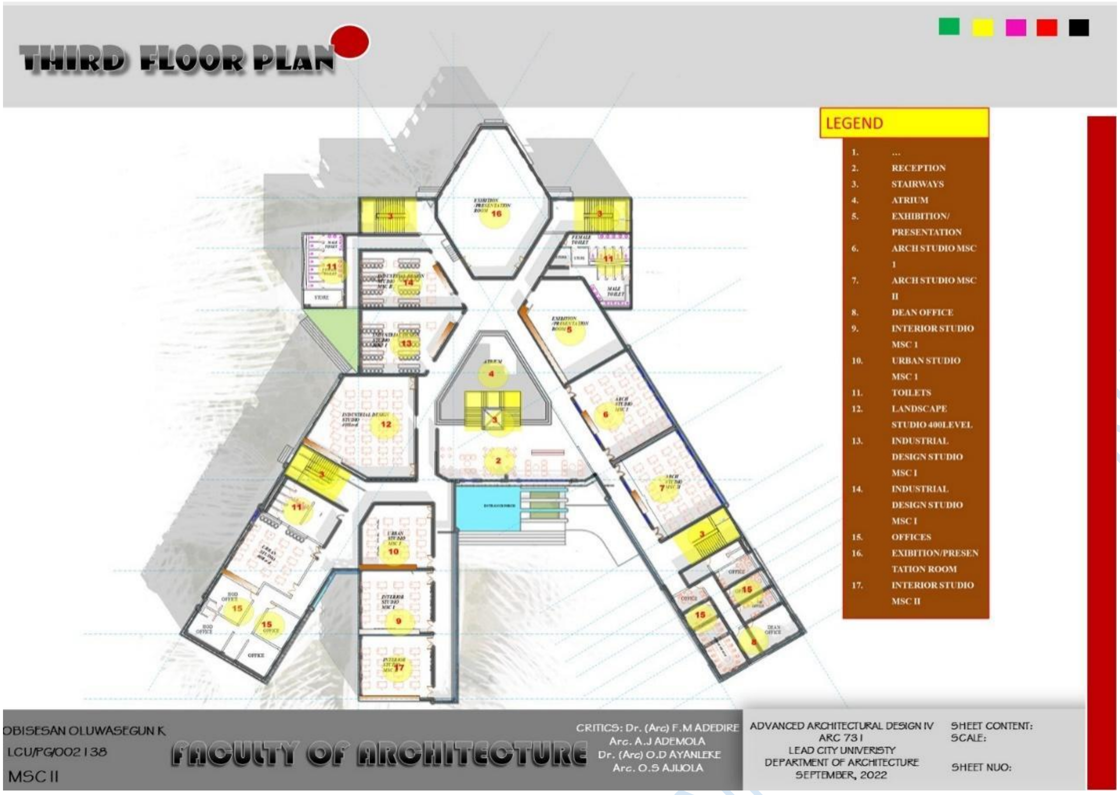
THIRD FLOOR PLAN
LEGEND
1. ...
2. RECEPTION
3. STAIRWAYS
4. ATRIUM
5. EXHIBITION/ PRESENTATION
6. ARCH STUDIO MSC 1
7. ARCH STUDIO MSC II
8. DEAN OFFICE
9. INTERIOR STUDIO MSC 1
10. URBAN STUDIO MSC 1
11. TOILETS
12. LANDSCAPE STUDIO 400LEVEL
13. INDUSTRIAL DESIGN STUDIO MSC I
14. INDUSTRIAL DESIGN STUDIO MSC I
15. OFFICES
16. EXIBITION/PRESENTATION ROOM
17. INTERIOR STUDIO MSC II
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERISTY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
SHEET CONTENT:
SCALE:
SHEET NUO:


ELEVATIONS
APPROACH VIEW
REAR VIEW
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERISTY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
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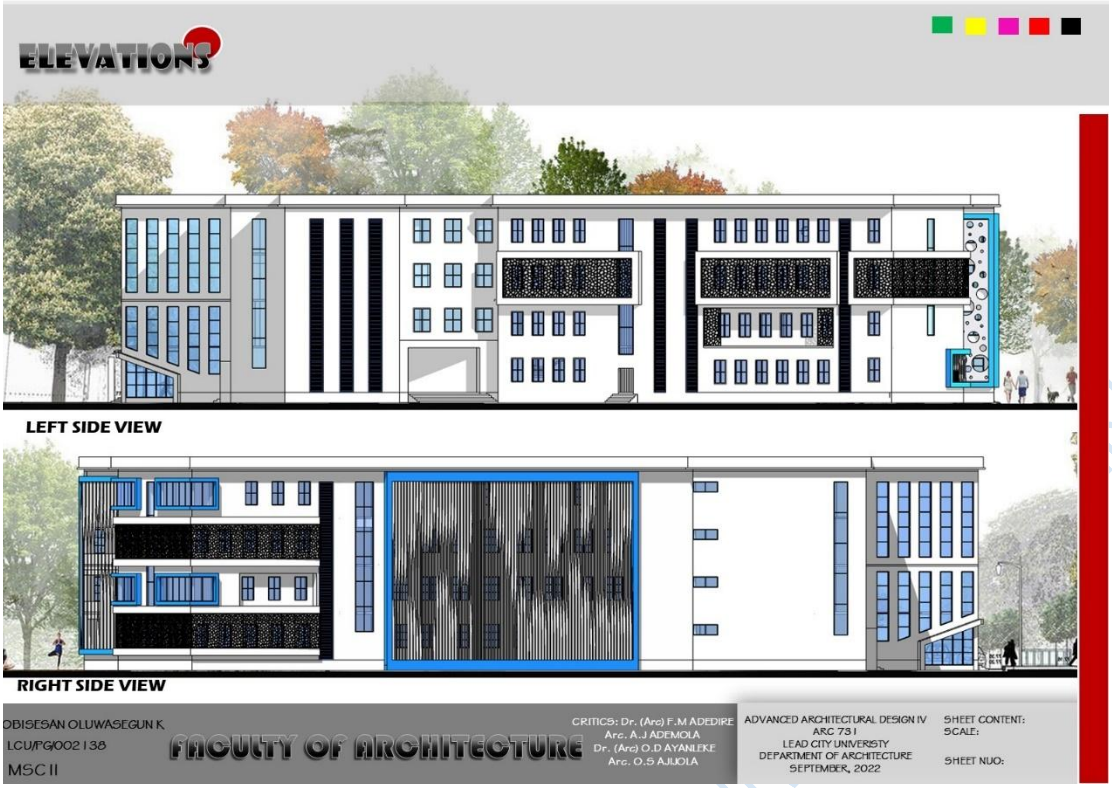
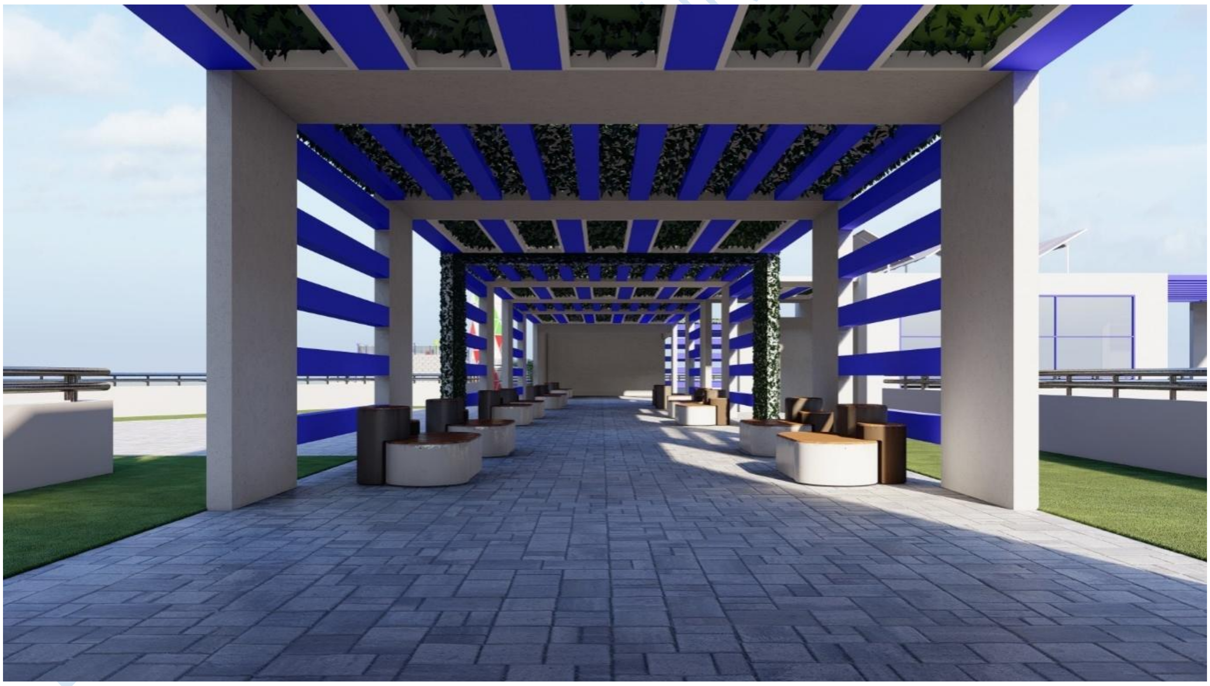

ELEVATIONS
LEFT SIDE VIEW
RIGHT SIDE VIEW
OBISESAN OLUWASEGUN K
LCU/PG/002138
MSC II
FACULTY OF ARCHITECTURE
CRITICS: Dr. (Arc) F.M ADEDIRE
Arc. A.J ADEMOLA
Dr. (Arc) O.D AYANLEKE
Arc. O.S AJIJOLA
ADVANCED ARCHITECTURAL DESIGN IV
ARC 731
LEAD CITY UNIVERISTY
DEPARTMENT OF ARCHITECTURE
SEPTEMBER, 2022
SHEET CONTENT:
SCALE:
SHEET NUO:

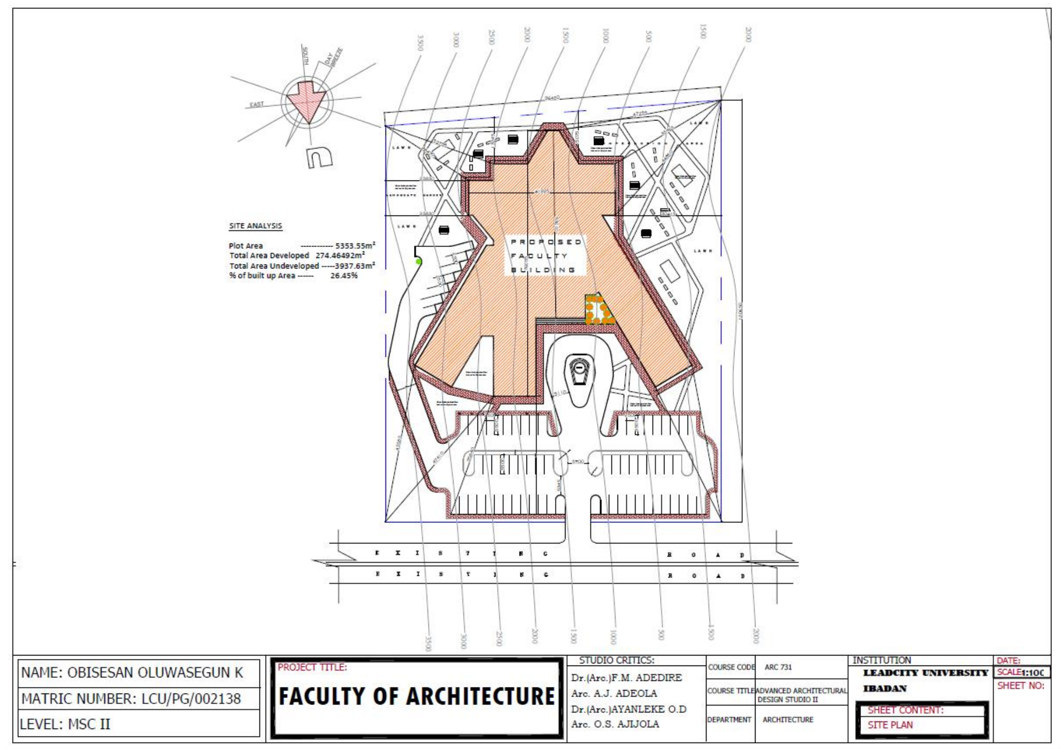

Lead City University
Ibadan
FACULTY OF ARCHITECTURE

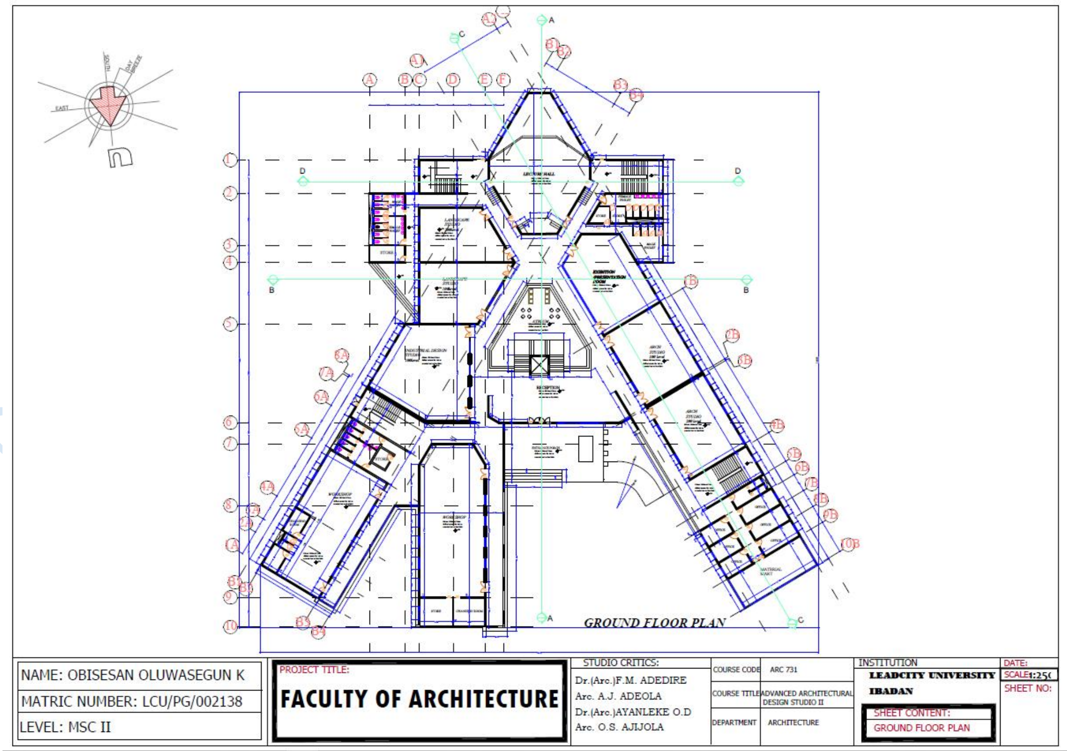

Lead City University
Ibadan
FACULTY OF ARCHITECTURE

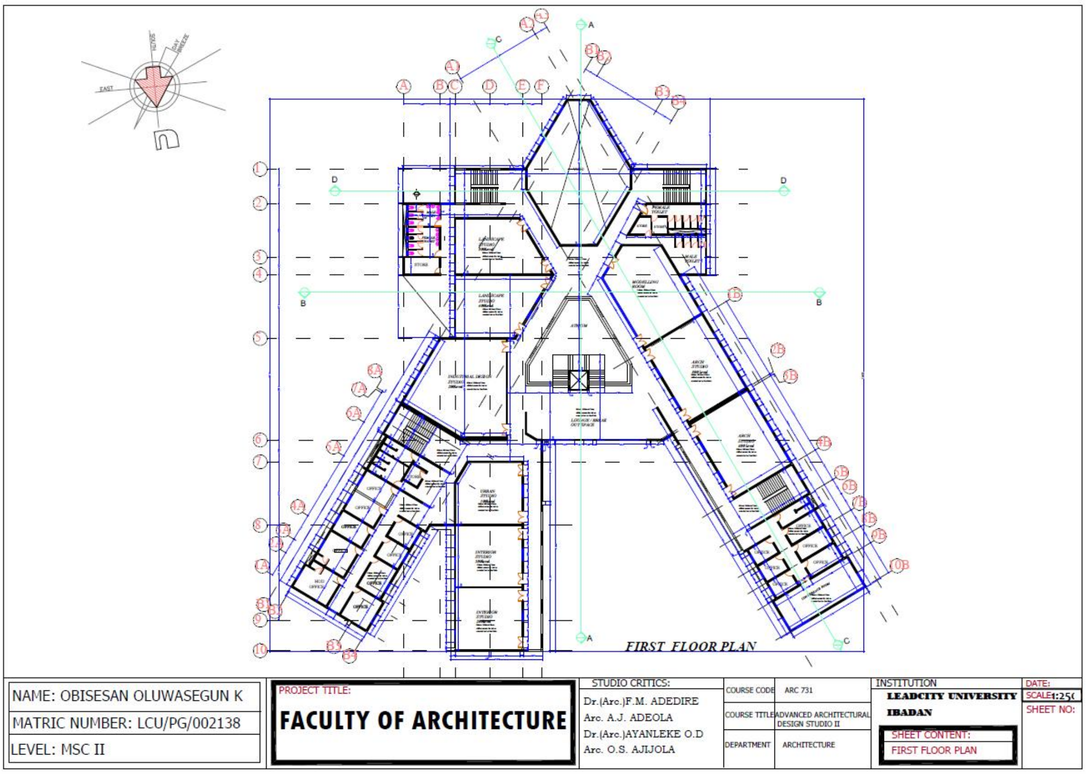

Lead City University
Ibadan



Appendix ii (Working Drawings)



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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
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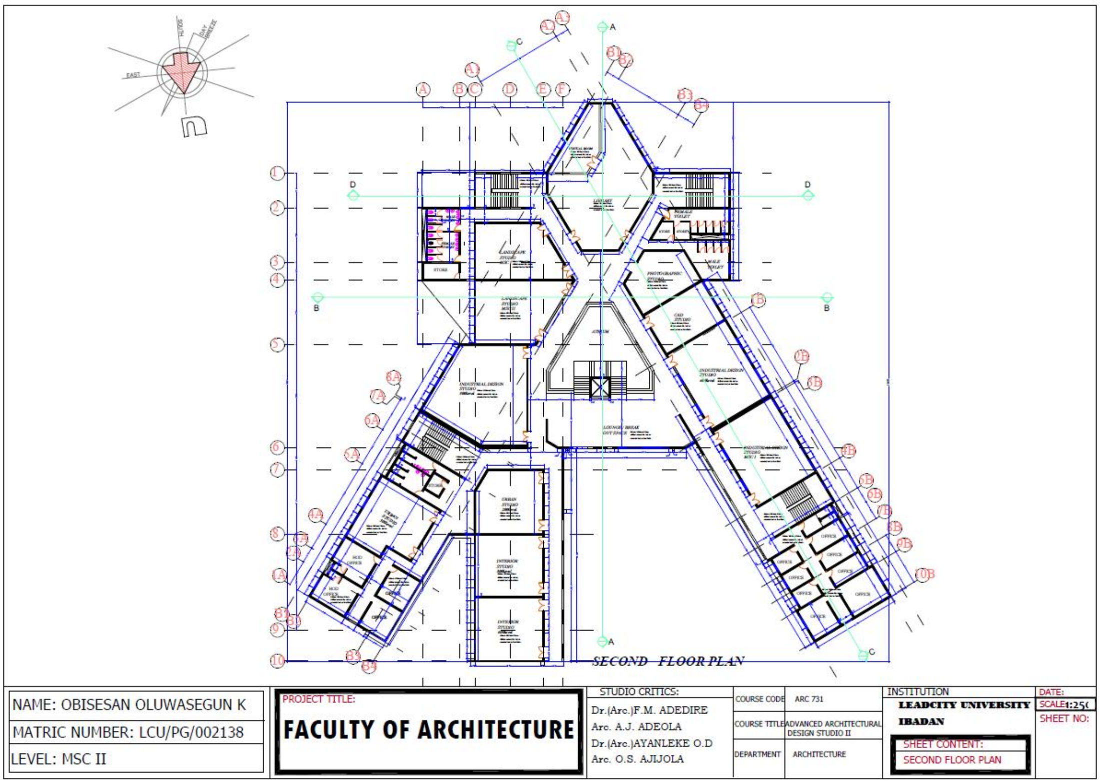
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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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IBADAN
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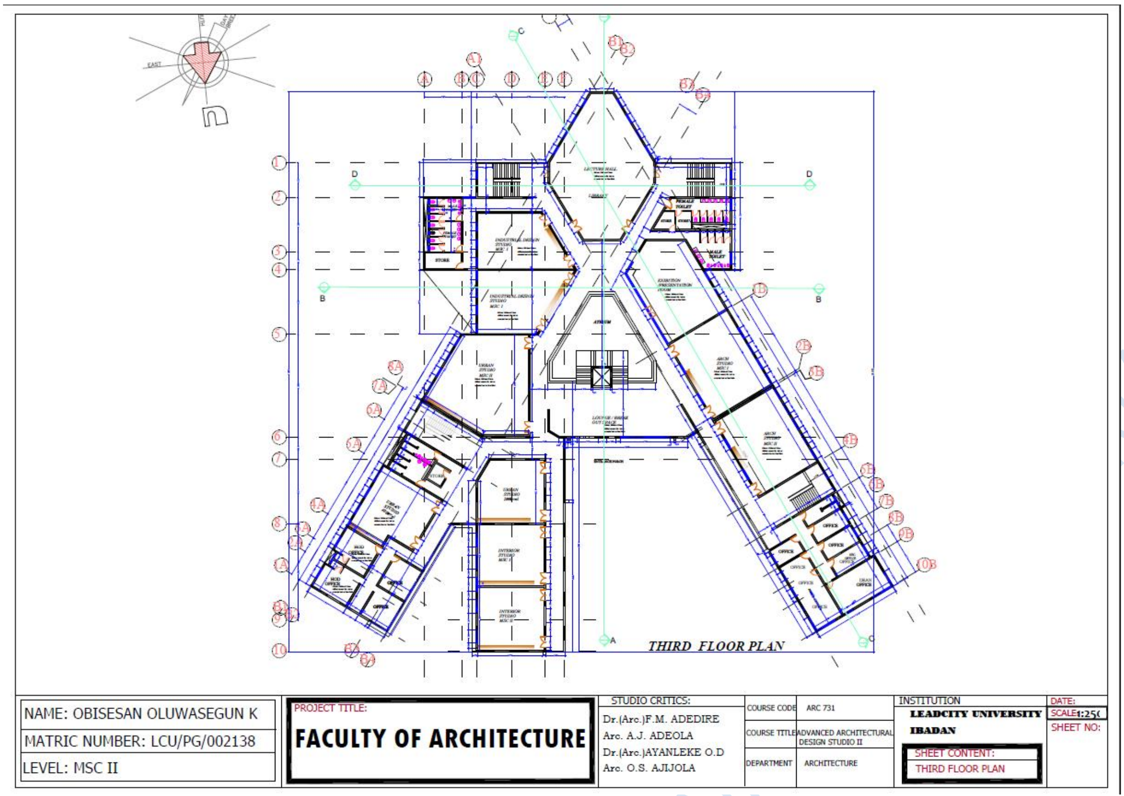
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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
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THIRD FLOOR PLAN
DATE:
SCALE 1:250
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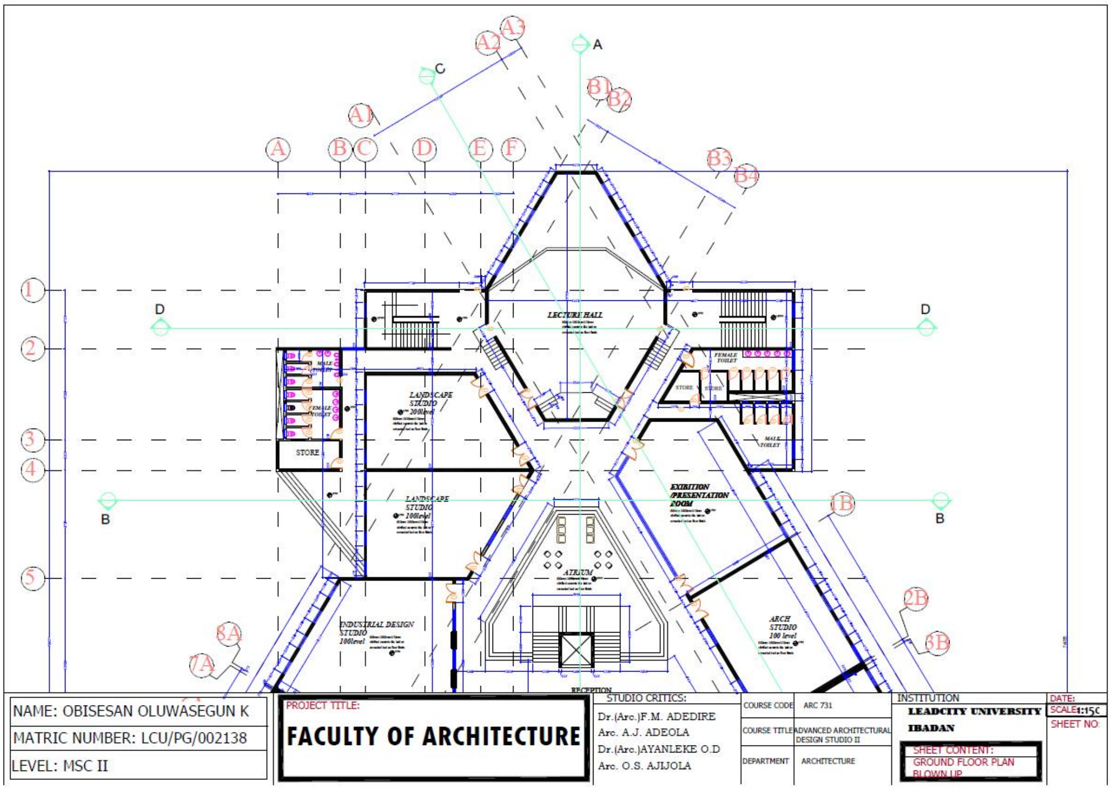
LECTURE HALL
FEMALE TOILET
STORE
MALE TOILET
LANDSCAPE STUDIO 200level
LANDSCAPE STUDIO 200level
EXIBITION /PRESENTATION ROOM
ATRIUM
INDUSTRIAL DESIGN STUDIO 200level
ARCH STUDIO 100 level
RECEPTION
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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INSTITUTION
LEADCITY UNIVERSITY IBADAN
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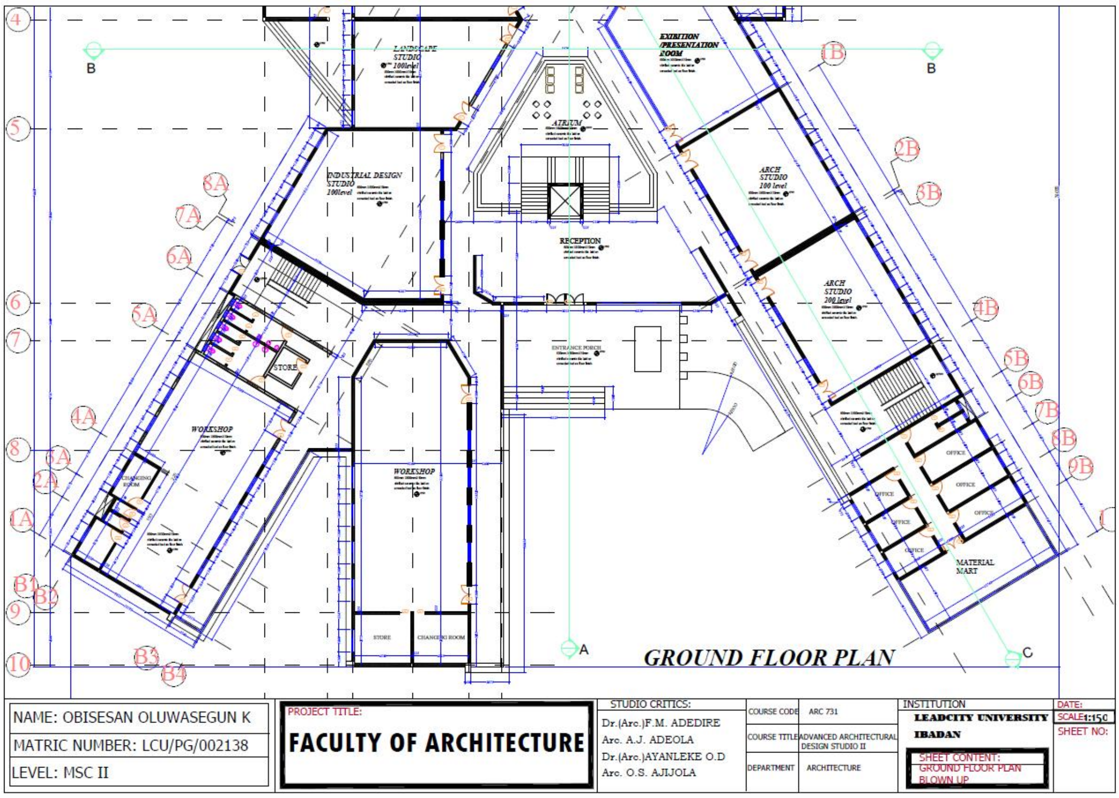
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ARCH STUDIO 200 level
STORE
ENTRANCE PORCH
WORKSHOP
CHANGING ROOM
WORKSHOP
STORE
CHANGING ROOM
OFFICE
MATERIAL MART
GROUND FLOOR PLAN
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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INSTITUTION
LEADCITY UNIVERSITY IBADAN
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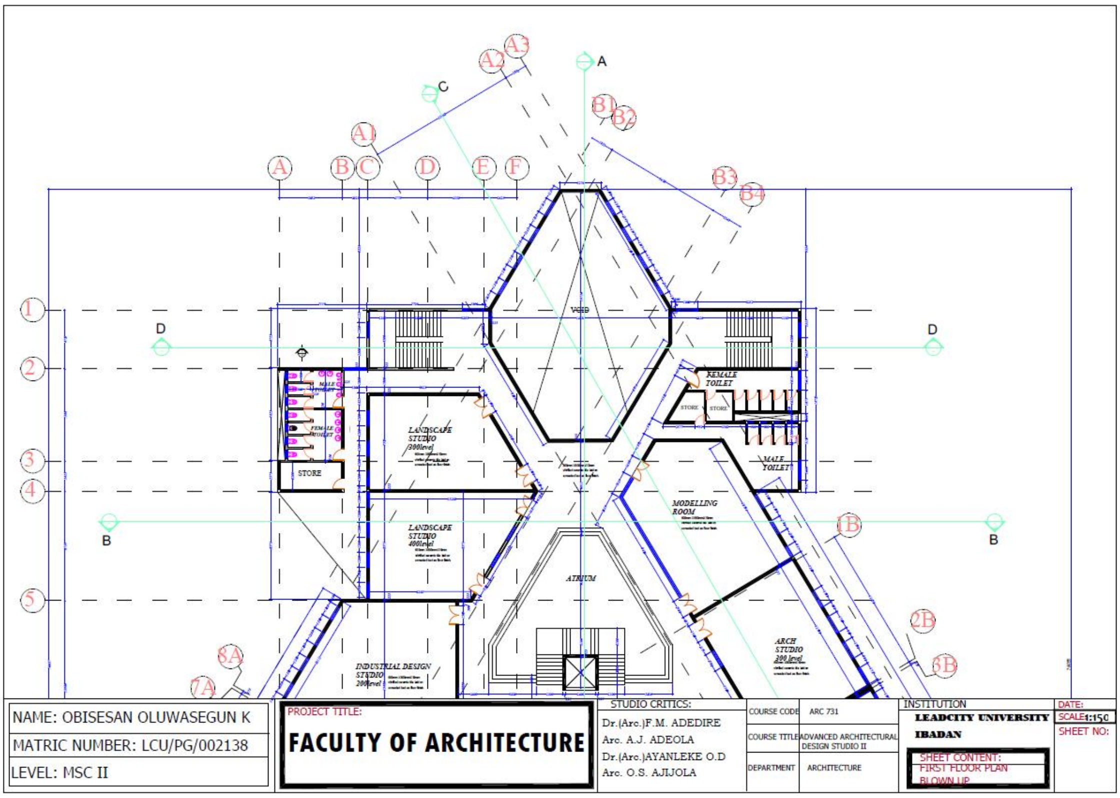
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FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
SHEET CONTENT:
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DATE:
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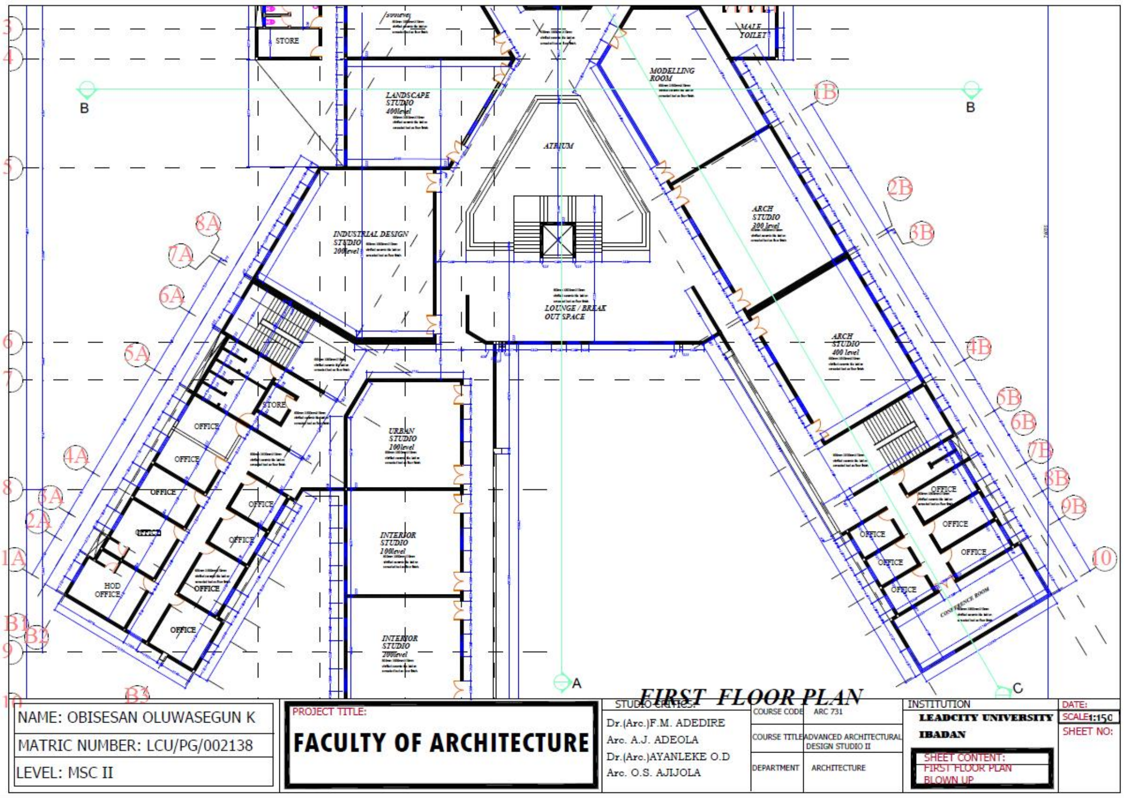
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MATRIC NUMBER: LCU/PG/002138
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FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
SHEET CONTENT:
FIRST FLOOR PLAN
BLOWN UP
DATE:
SCALE 1:150
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ARCH STUDIO 300 level
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LOUNGE / BREAK OUT SPACE
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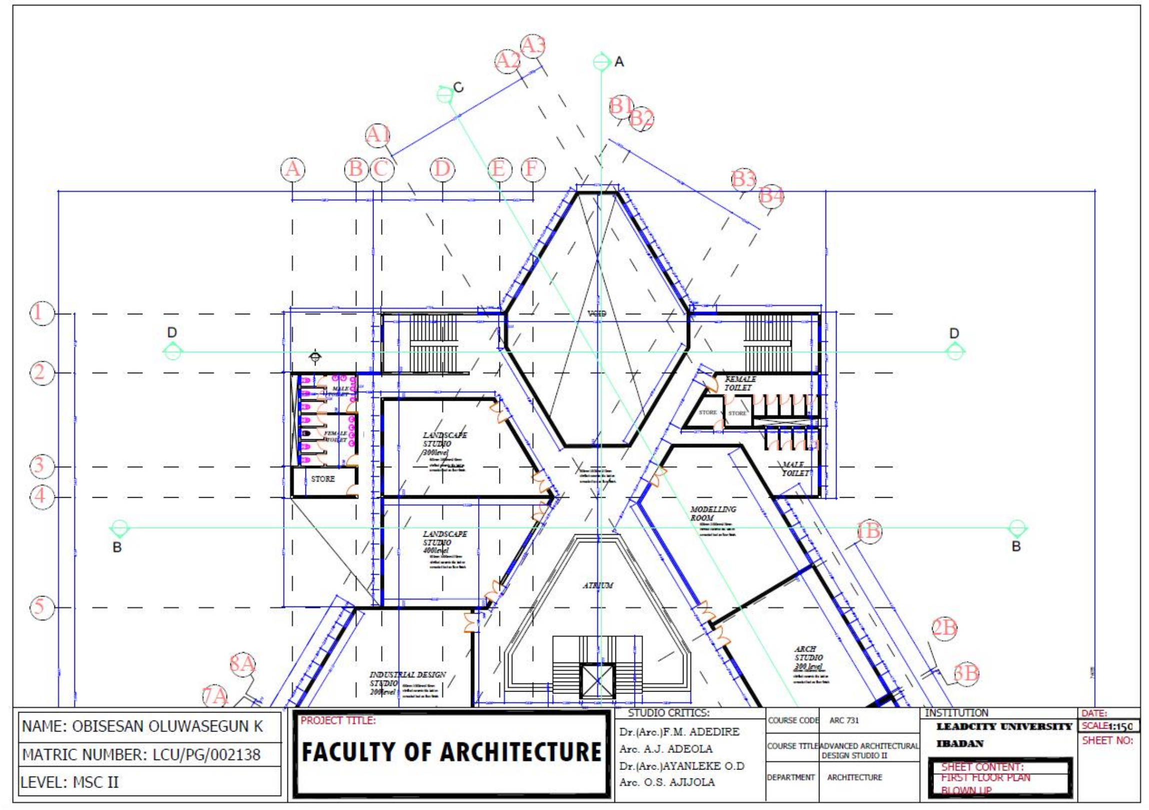
OFFICE
HOD OFFICE
CONFERENCE ROOM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MATRIC NUMBER: LCU/PG/002138
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PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
SHEET CONTENT:
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DATE:
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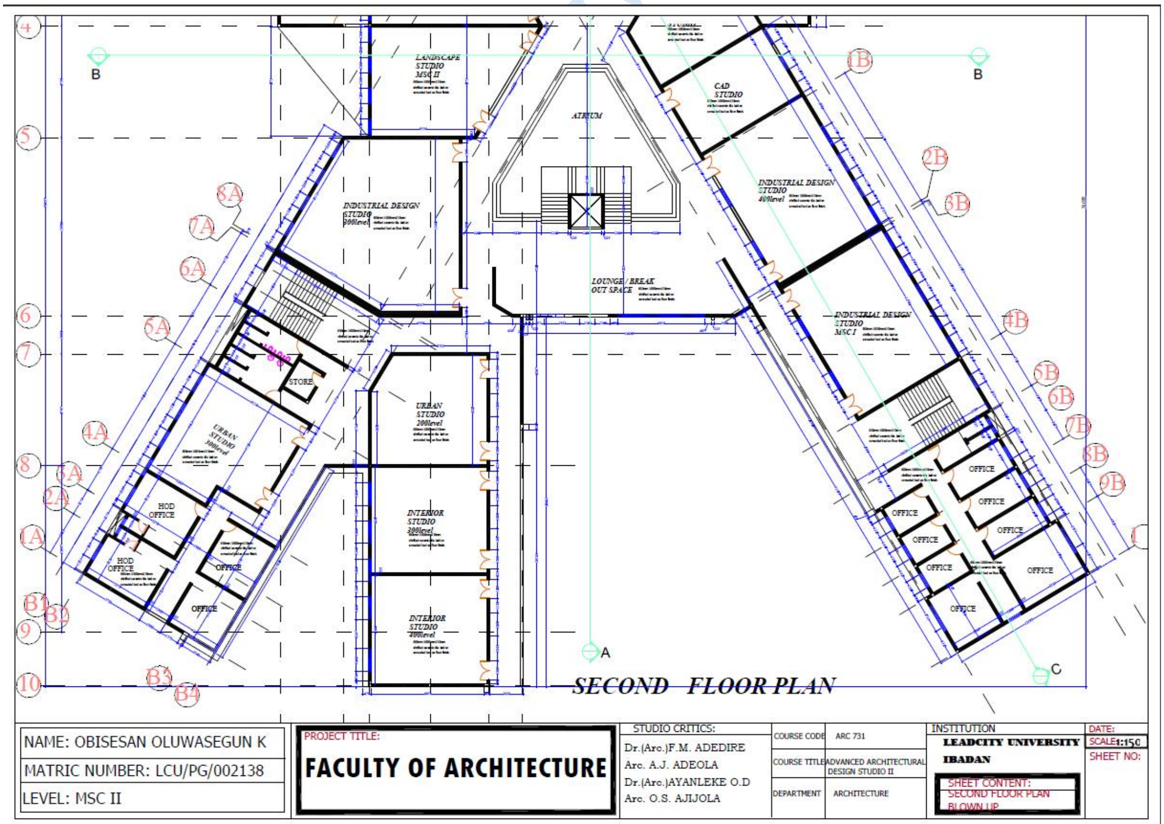
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NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
SHEET CONTENT:
SECOND FLOOR PLAN BLOWN UP
DATE:
SCALE 1:150
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CAD STUDIO
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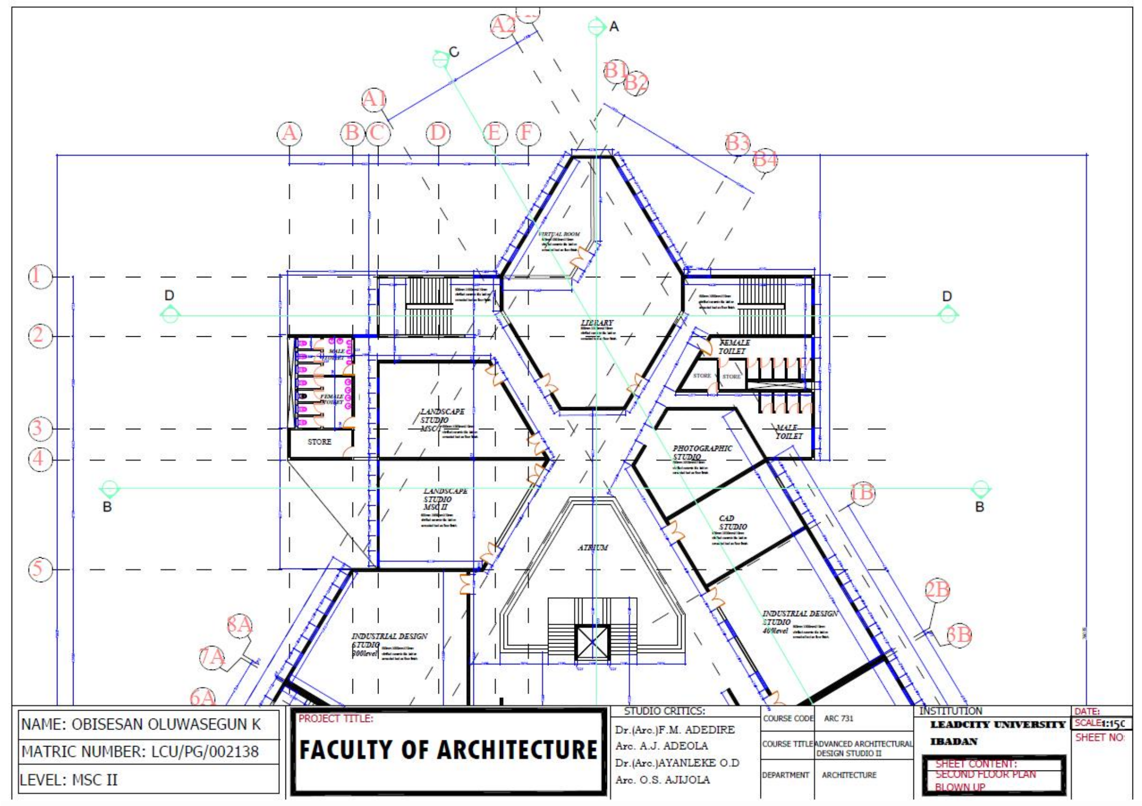
OFFICE
STORE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LIBRARY
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MALE TOILET
STORE
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LANDSCAPE STUDIO MSC II
PHOTOGRAPHIC STUDIO
CAD STUDIO
ATRIUM
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INDUSTRIAL DESIGN STUDIO 300level
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
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Dr.(Arc.)AYANLEKE O.D
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COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
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LEADCITY UNIVERSITY IBADAN
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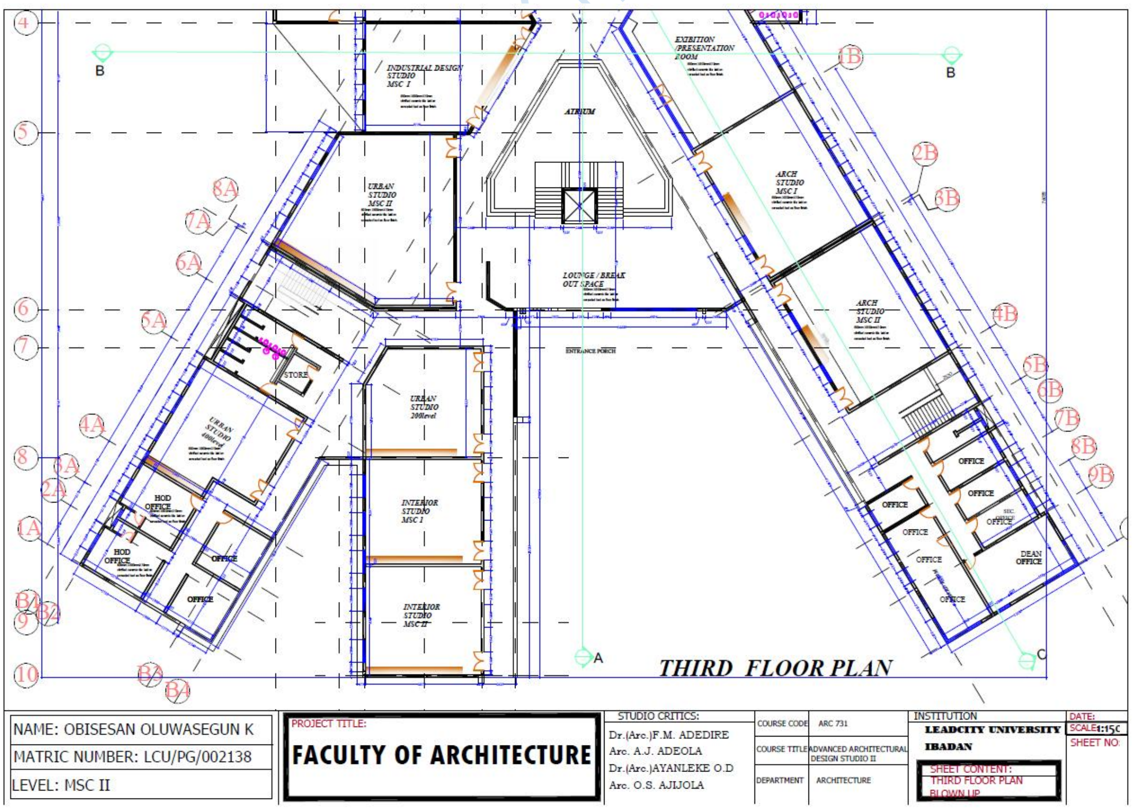
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ARCH STUDIO MSC II
STORE
URBAN STUDIO 400level
URBAN STUDIO 200level
INTERIOR STUDIO MSC I
INTERIOR STUDIO MSC II
HOD OFFICE
OFFICE
SEC.
DEAN OFFICE
THIRD FLOOR PLAN
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
COURSE TITLE ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY IBADAN
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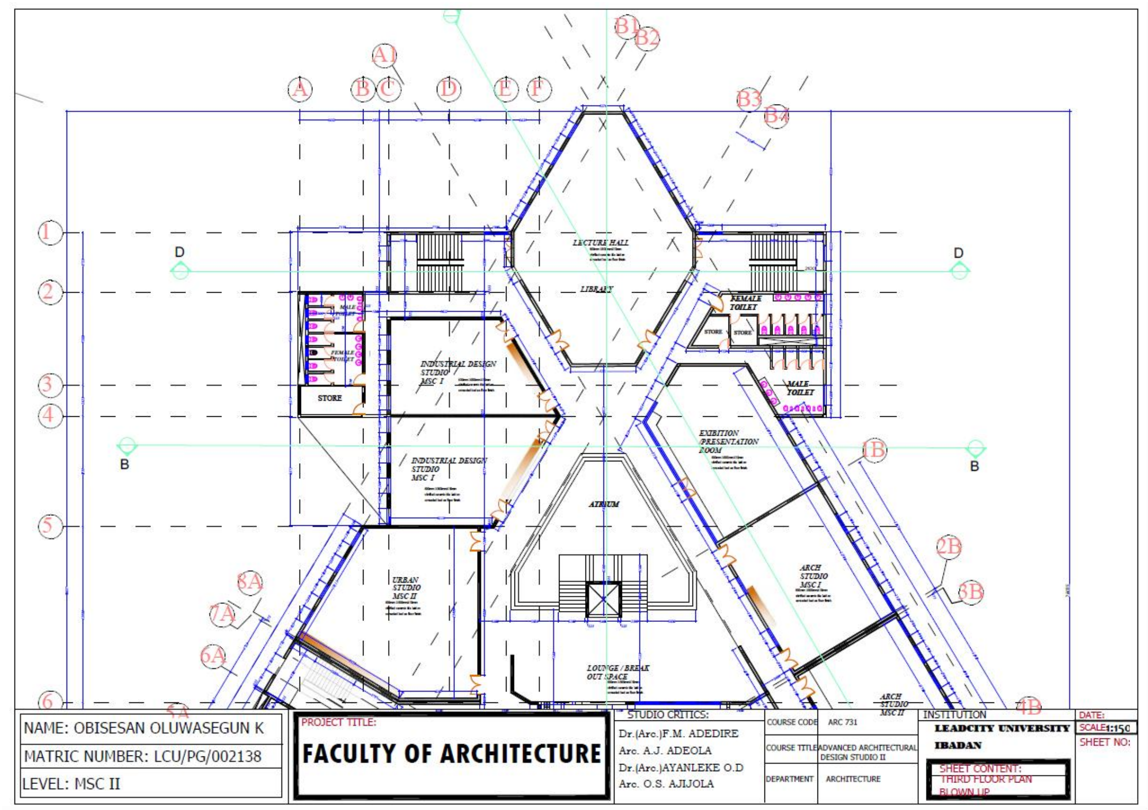
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LIBRARY
FEMALE TOILET
MALE TOILET
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EXIBITION /PRESENTATION ROOM
ATRIUM
URBAN STUDIO MSC II
ARCH STUDIO MSC I
LOUNGE / BREAK OUT SPACE
ARCH STUDIO MSC II
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE
ARC 731
COURSE TITLE
ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT
ARCHITECTURE
INSTITUTION
LEADCITY UNIVERSITY
IBADAN
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THIRD FLOOR PLAN BLOWN UP
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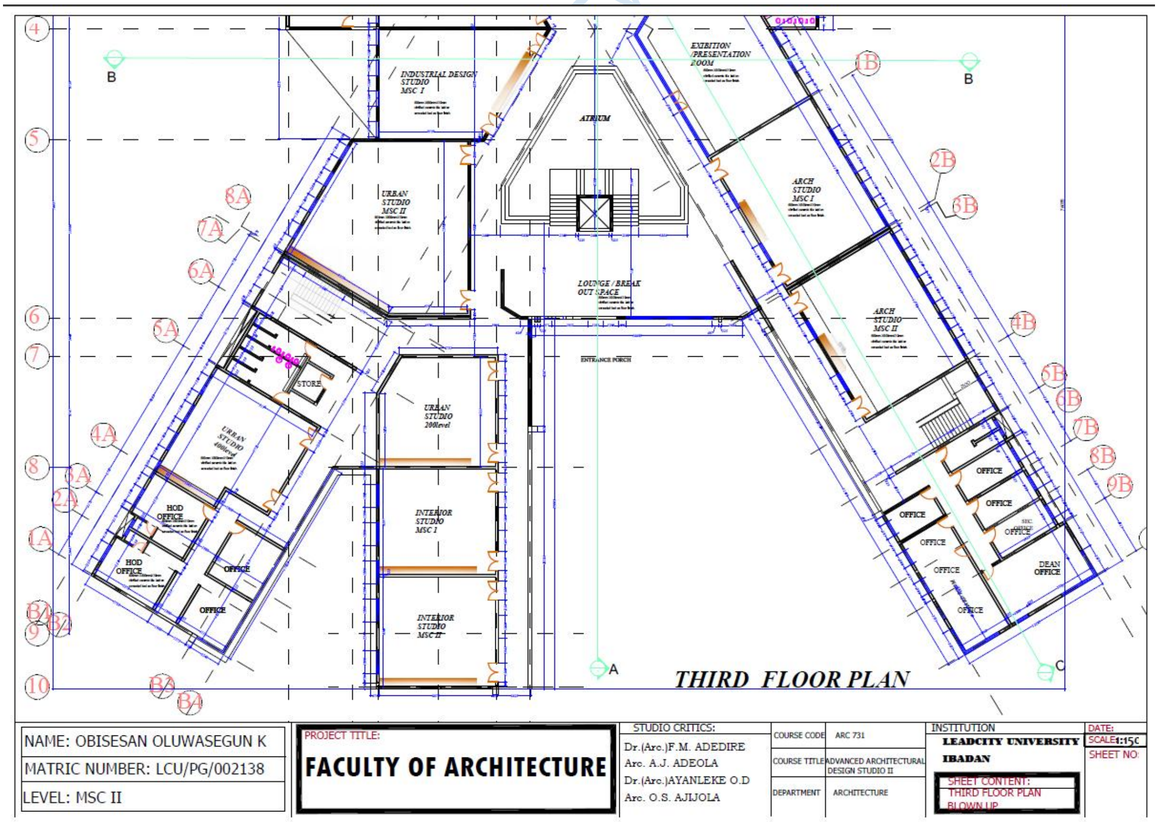
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EXIBITION /PRESENTATION ROOM
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ARCH STUDIO MSC II
ENTRANCE PORCH
STORE
URBAN STUDIO 400level
URBAN STUDIO 200level
INTERIOR STUDIO MSC I
INTERIOR STUDIO MSC II
HOD OFFICE
OFFICE
DEAN OFFICE
SEC. OFFICE
THIRD FLOOR PLAN
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE
ARC 731
COURSE TITLE
ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT
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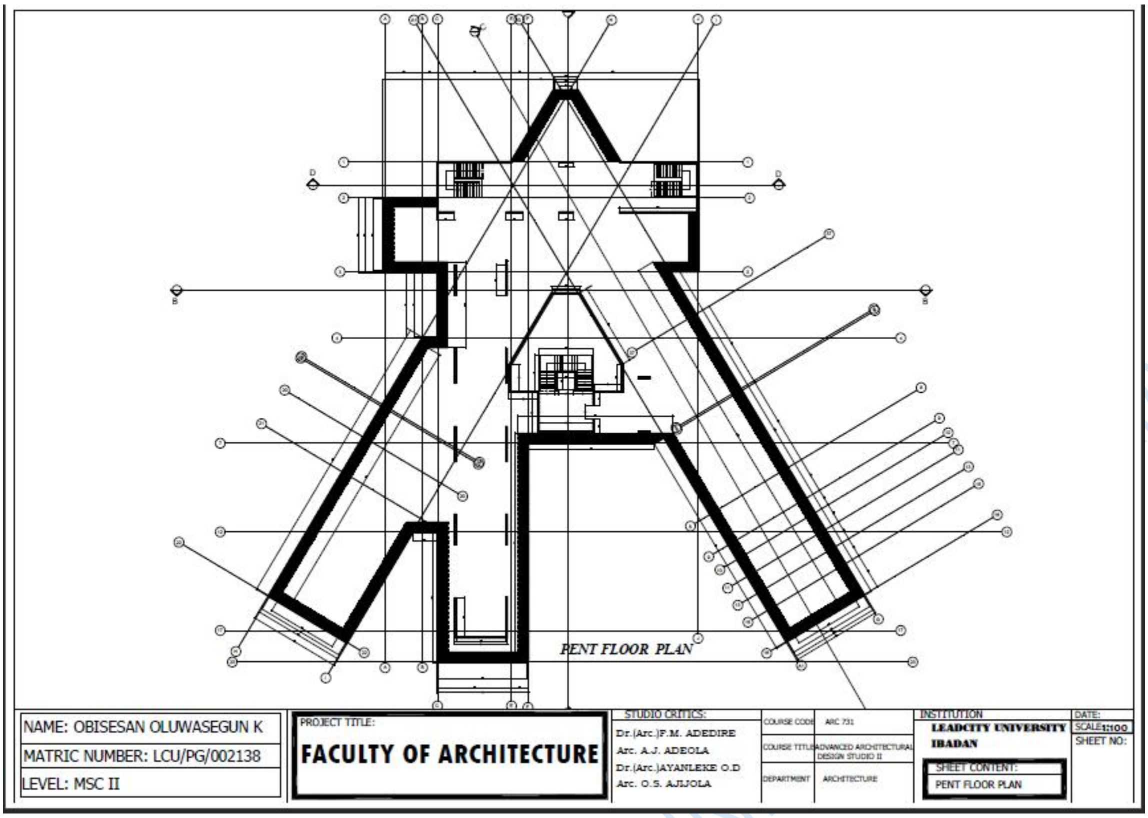
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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
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Arc. O.S. AJIJOLA
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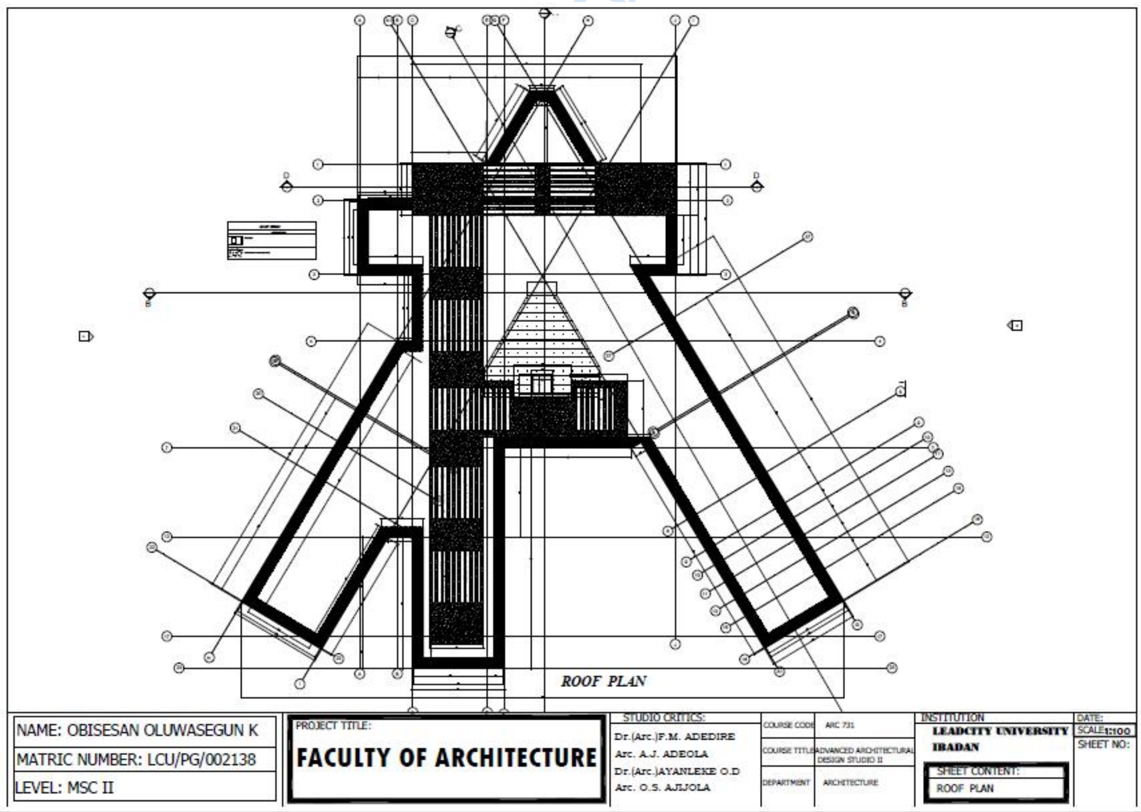
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LEVEL: MSC II
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FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
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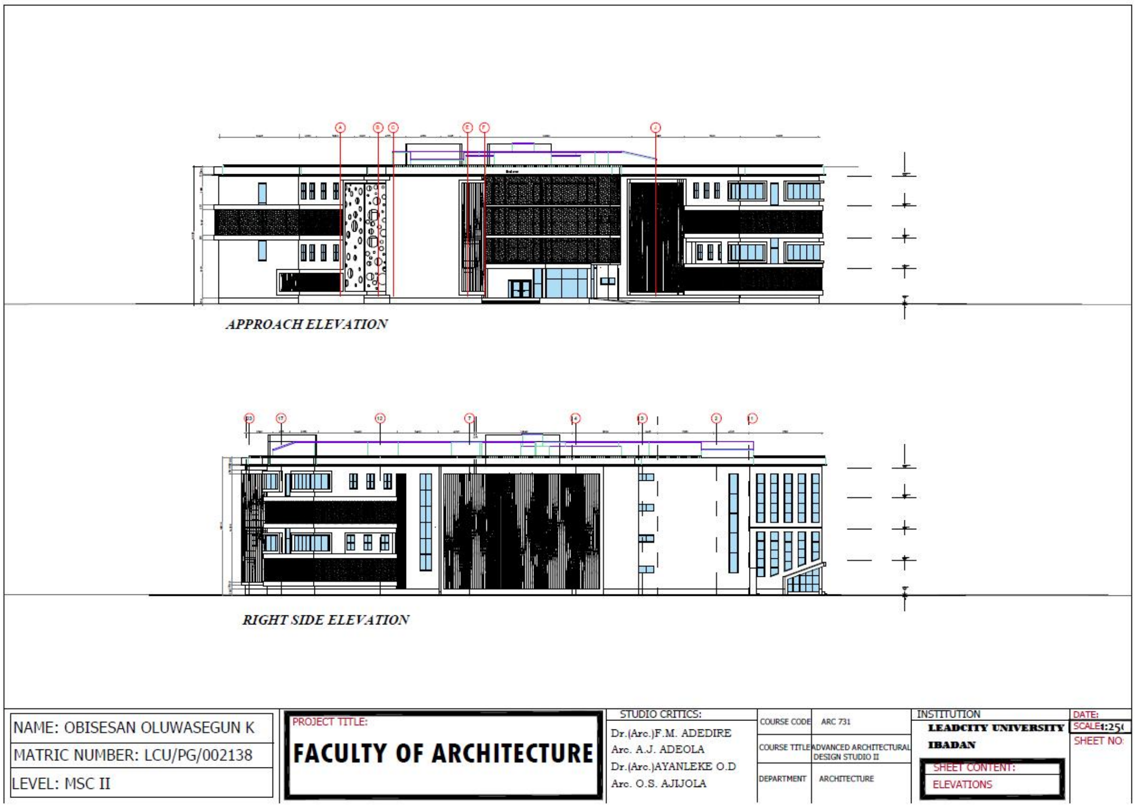
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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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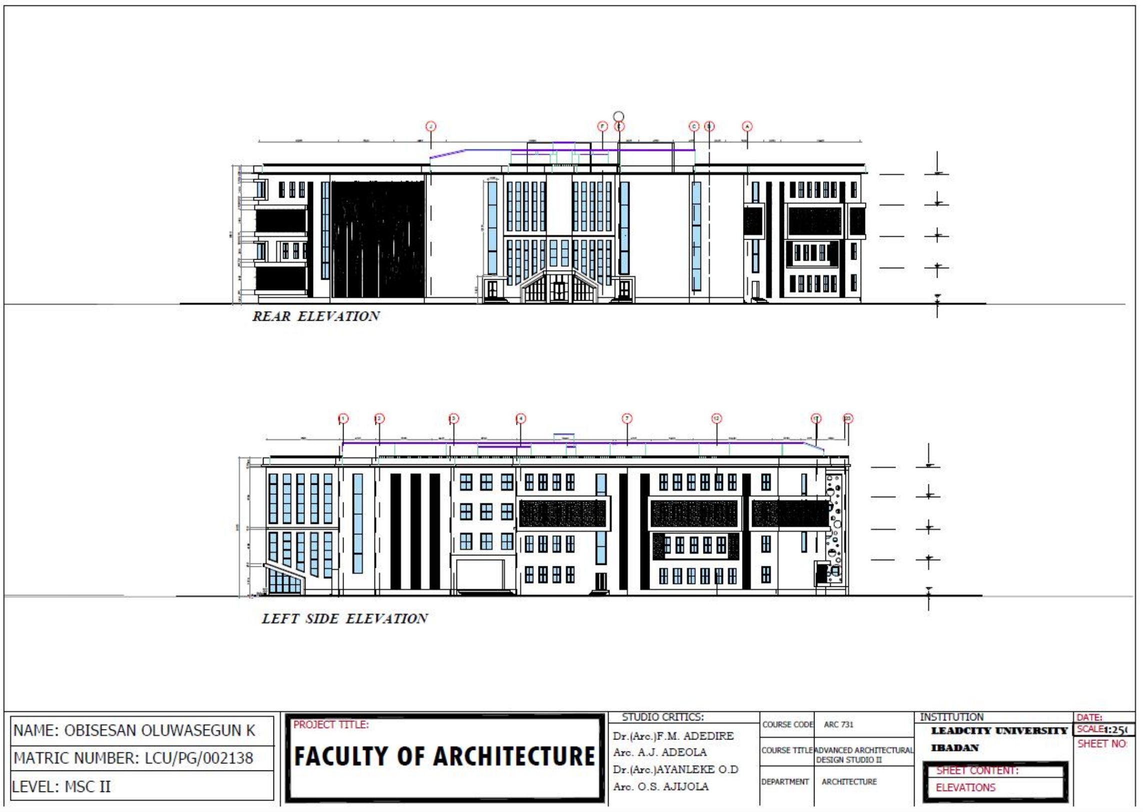
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FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
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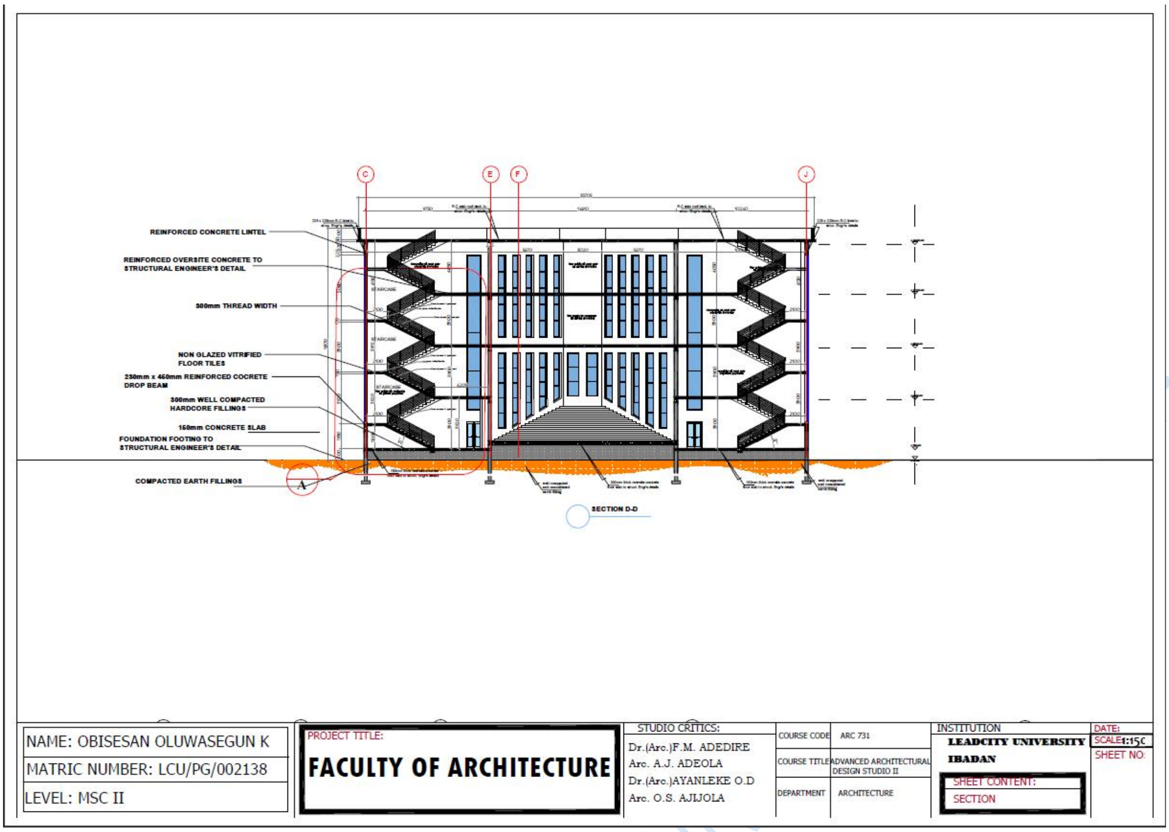
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230mm x 450mm REINFORCED COCRETE DROP BEAM
300mm WELL COMPACTED HARDCORE FILLINGS
150mm CONCRETE SLAB
FOUNDATION FOOTING TO STRUCTURAL ENGINEER'S DETAIL
COMPACTED EARTH FILLINGS
SECTION D-D
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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IBADAN
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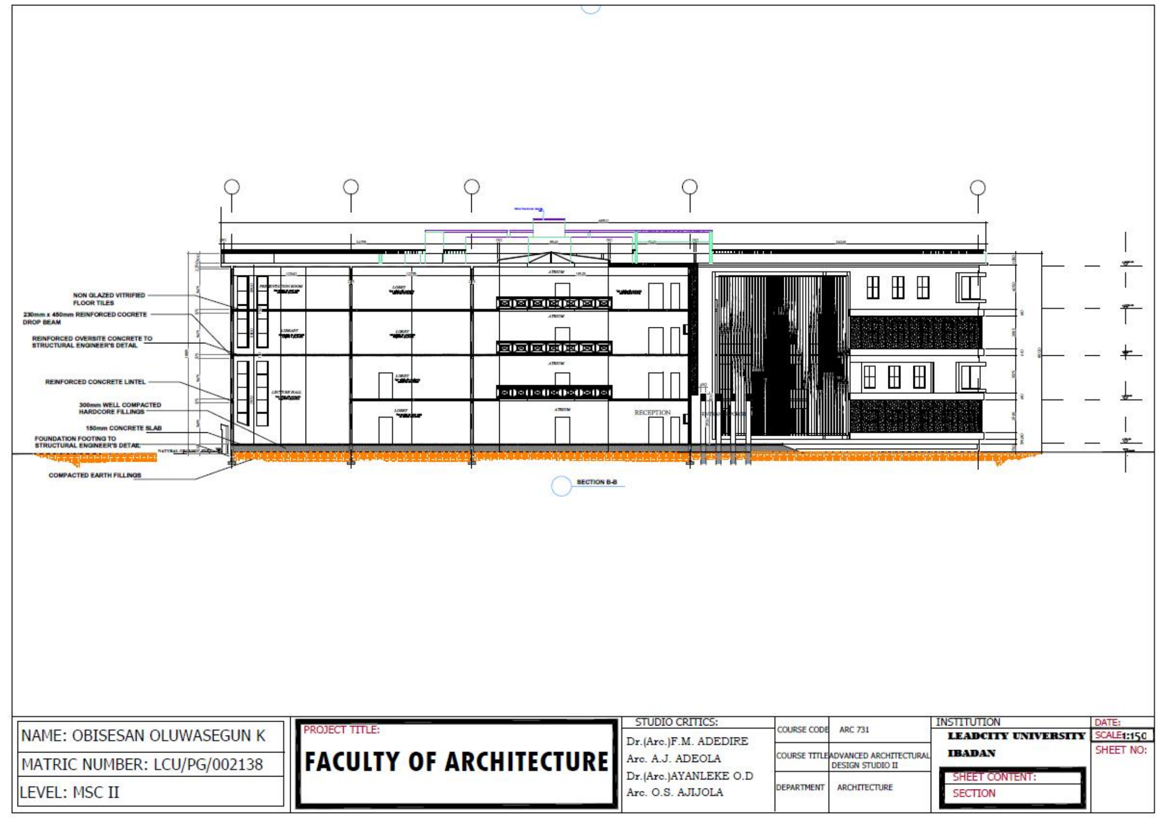
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REINFORCED CONCRETE LINTEL
300mm WELL COMPACTED HARDCORE FILLINGS
150mm CONCRETE SLAB
FOUNDATION FOOTING TO STRUCTURAL ENGINEER'S DETAIL
COMPACTED EARTH FILLINGS
RECEPTION
SECTION B-B
NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE ARC 731
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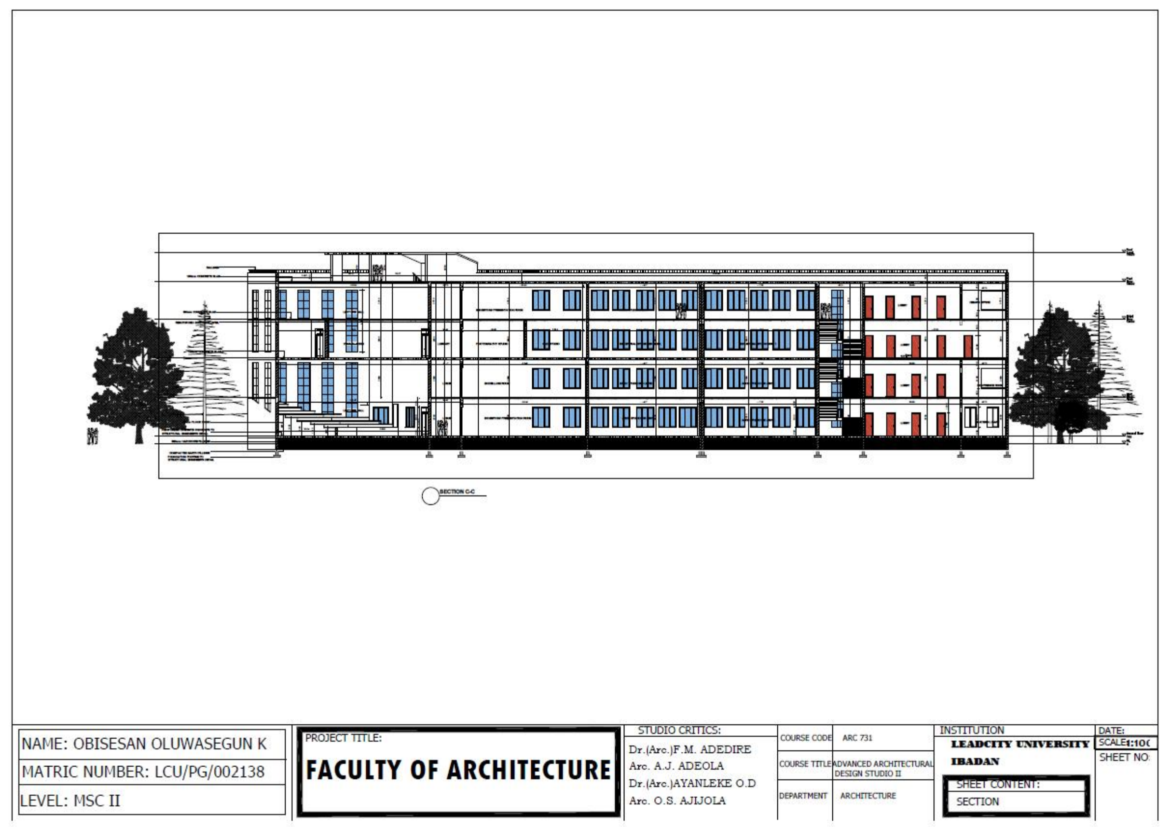
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NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II
PROJECT TITLE:
FACULTY OF ARCHITECTURE
STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA
COURSE CODE
ARC 731
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ADVANCED ARCHITECTURAL DESIGN STUDIO II
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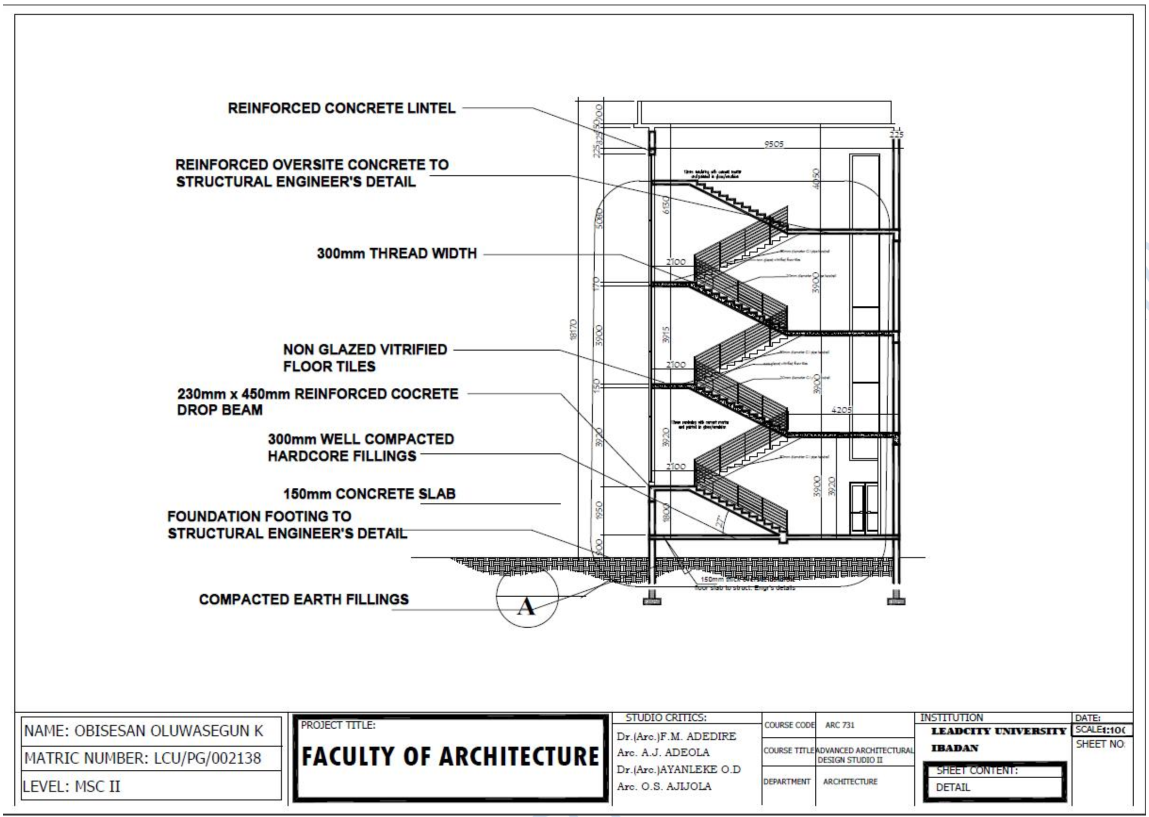
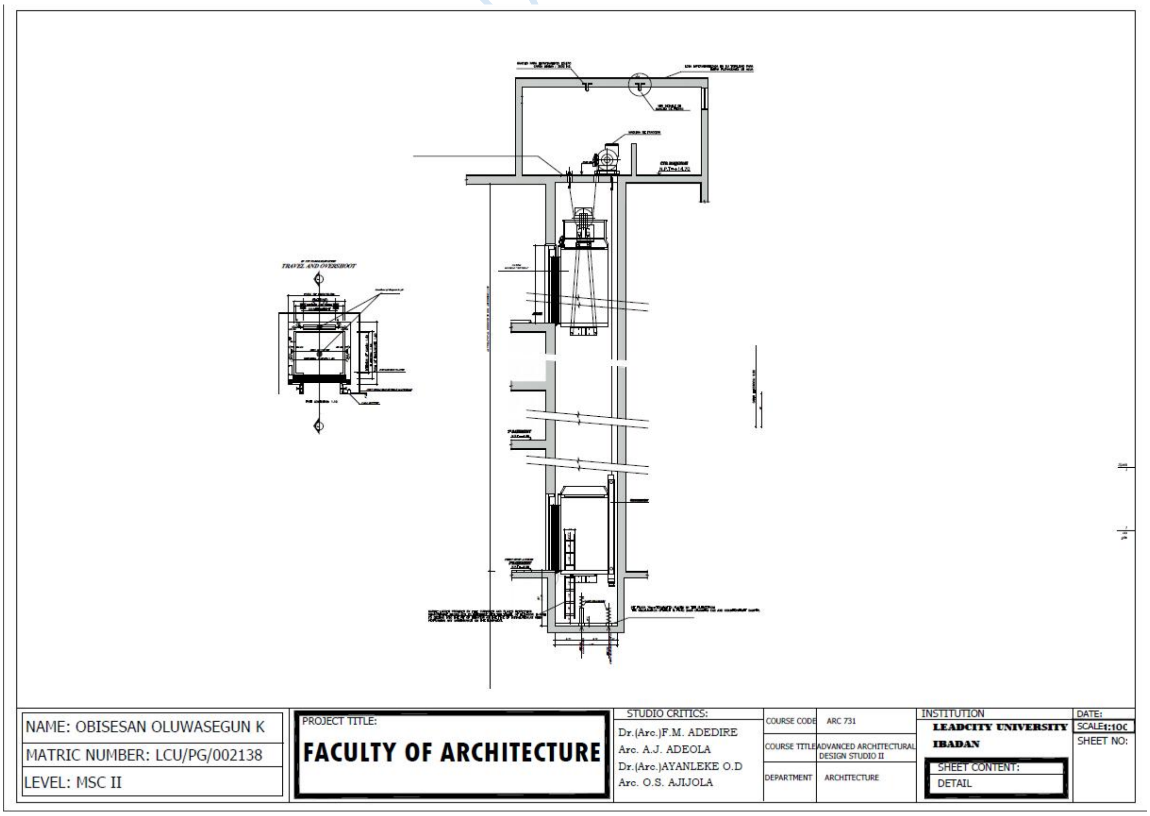
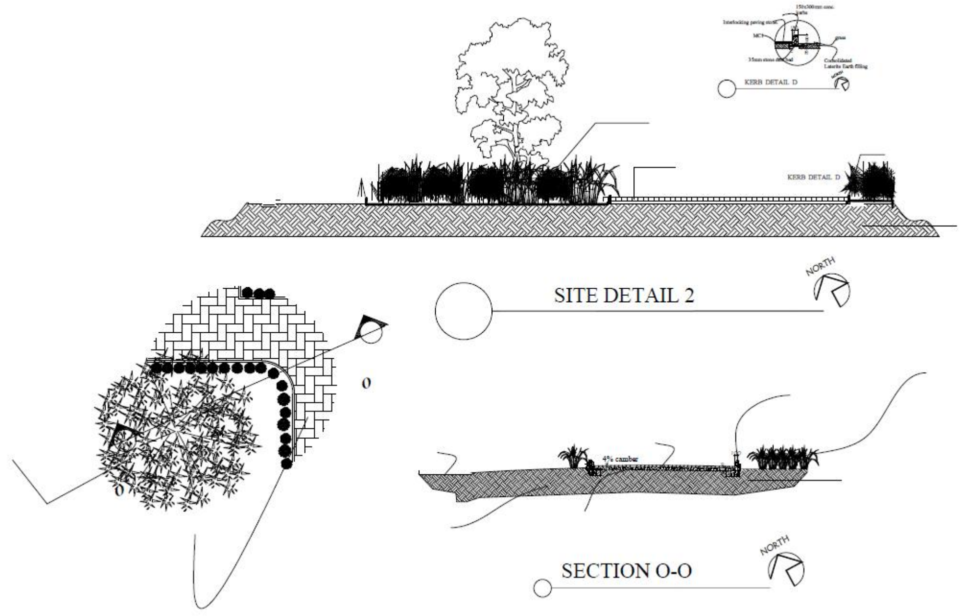
Appendix iii (Details)







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MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II

PROJECT TITLE:
FACULTY OF ARCHITECTURE

STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
Dr.(Arc.)AYANLEKE O.D
Arc. O.S. AJIJOLA

COURSE CODE: ARC 731
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INSTITUTION: LEADCITY UNIVERSITY IBADAN
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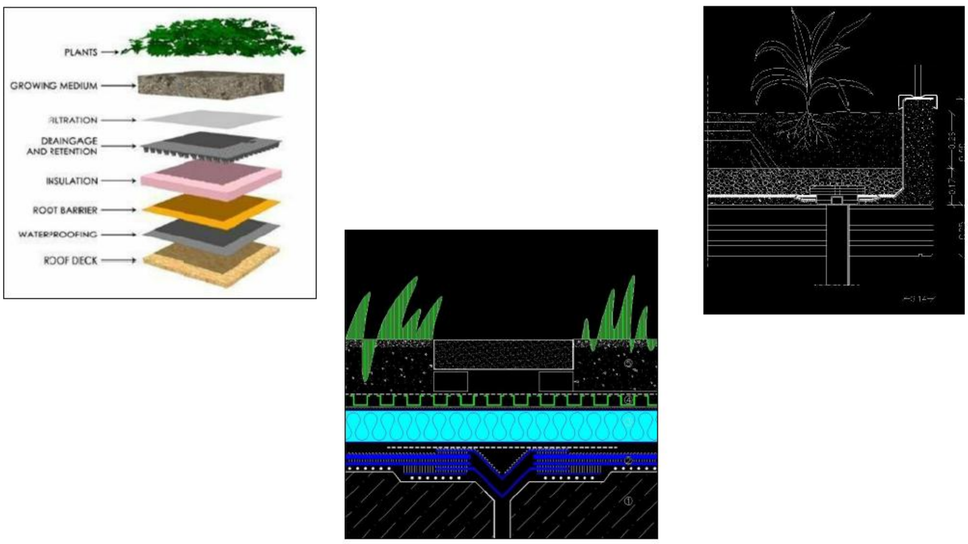

NAME: OBISESAN OLUWASEGUN K
MATRIC NUMBER: LCU/PG/002138
LEVEL: MSC II

PROJECT TITLE:
FACULTY OF ARCHITECTURE

STUDIO CRITICS:
Dr.(Arc.)F.M. ADEDIRE
Arc. A.J. ADEOLA
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Arc. O.S. AJIJOLA

COURSE CODE: ARC 731
COURSE TITLE: ADVANCED ARCHITECTURAL DESIGN STUDIO II
DEPARTMENT: ARCHITECTURE

INSTITUTION: LEADCITY UNIVERSITY IBADAN
SHEET CONTENT: DETAILS

DATE:
SCALE: 1:100
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Biodata

A. Personal Data:

1. Name: Oluwasegun Kayode OBISESAN

Permanent Home Address: 13M Fadahunsi Onilegogoro Premier Mokola Ibadan, Oyo State, Nigeria

Email Address: oluwasegunobiz@gmail.com

Phone Number: 08062773814

2. Date of Birth: 6th May, 1984

Place of Birth: Osogbo, Osun State

Marital Status: Married

3. Nationality: Nigerian

4. Next of Kin: Atinuke Morenike OBISESAN

13M Fadahunsi Onilegogoro Premier Mokola Ibadan, Oyo State, Nigeria

B. Education Background with Date

1. Institution Attended with Dates

i. Lead City University Ibadan, Toll gate Oyo State 2018 to 2020

ii. Lead City University Ibadan Toll gate, Oyo State 2020 to 2022

iii. The Federal University of Technology Akure, Ondo State 2010 to 2012

iv. Federal Polytechnic Ede Osun State 2005 to 2007

v. Federal Polytechnic Ede Osun State 2002 to 2004

vi. Ikolaba Grammer school Agodi Gate Ibadan 2001

vii. Wesley College of Science Elekuro Ibadan, Oyo State 1997 to 2000

vi. Unity School Ikire Osun State 1994 to 1997

vii. Sacred Hearth Nursery & Primary Ring Road Ibadan 1986 to 1993

2. Qualification with Dates

i. MSc Architecture: 2022

ii. BSc Architecture: 2020

iii. Post Graduate Diploma Architecture 2012

iv. Higher National Diploma Architecture 2007

v. Ordinary National Diploma Architecture 2005

vi. NECO 2001

C. Working Experience with Date

Architect I: Federal Medical Centre Abeokuta Idi – Aba, Ogun State 2018 to till date

Telecommute Architect: Arkibest En-konsult Ltd. 13 M Fadahunsi Onilegogoro street, Premier Hill Ibadan Oyo State 2022 to till date

Project Architect: El-Archy dev koncepts Ltd 13 M Fadahunsi Onilegogoro street, Premier Hill, Ibadan Oyo State 2010 to 2015

Introductory technology Teacher: St. Catherine Comprehensive Secondary School Isialangwa Local Govt. Abia State (NYSC) 2008-2009

Clerk of works: International Architect: 13M fadahunsi Onilegogoro Premier Hill Ibadan, Oyo State. 2011 to 2012

I.T student: Ministry of Works and Housing, Ibadan, Oyo State. 2005 to 2006

SIWES: ASK Consult Ltd OGC building beside Favors building Bodija Ibadan, Oyo State 2003

D. **Membership of Professional Bodies**

Graduate Member of Nigeria Institute of Architect (NIA)

E. Publication

Evaluation of Circulation Paths in Public Buildings in terms of Accessibility (Unpublished)

Evaluation Of Natural Lightning in Faculty Buildings (Unpublished)

F. Referees

1. Arc. (Dr.) Funmilayo Adedire
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08080997437

2. Arc Olusegun Akintola
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Mokola Ibadan Oyo State
08023504869

3. Arc. Oyenekan 'Lola
Arkibest En-Konsult Ltd
13 M Fadahunsi Onilegogoro premier Hill
Mokola Ibadan Oyo State
08063630345

4. Engr. Yinka Abokede
Olu-Ola & Associate
13 M Fadahunsi Onilegogoro premier Hill
Mokola Ibadan Oyo State
09022142122

University Compliance Form

This is to certify that this thesis by Oluwasegun Kayode OBISESAN with Matriculation Number LCU/PG/002138 in the Department of Architecture, Faculty of Environmental Design and Management, Lead City University, Ibadan is in full compliance with the approval of the University's format and style.

………………………………….   ……………………………

Signature   Date