

Ministère de l'Enseignement supérieur et de la Recherche scientifique  
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Faculté des Sciences et de la Technologie



THE DEPARTMENT OF ARCHITECTURE AND LACOMOFA LABORATORY ORGANIZE

1<sup>st</sup>  
AUITM

THE FIRST

# INTERNATIONAL WORKSHOP

ARCHITECTURAL AND URBAN INVESTIGATION  
TOOLS AND METHODS

Biskra on 17-18 May 2022

## Studios

**Studio 01:** *Architectural Scale : post occupancy evaluation*  
Mezerdi Toufik / Bensmina Lataoui/Boudouka Ayoub.

**Studio 02:** *Architectural Scale: Indoor lighting assessment*  
Daich Safa / khelil Sarah / Ahriz Atef

**Studio 03:** *Urban Scale : Acoustic measurements along paths*  
Dakhia Azzedine /Bouzir Talal /Dechaicha Assoule/ Khachef Sarah

**Studio 04:** *Urban Scale : Outdoor thermal comfort assessment*  
Bouzaher Soumaya/Maatalah Elhadi /Medouki Moustafa /Berkouk Djhad

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# Architectural and urban investigation tools and methods international Workshop

In Biskra on 17-18 May 2022

## Goals

The main objective of the workshop is to expose tools and methods developed recently and used by researchers in the architectural and urban field, to improve the assessment accuracy of the built environment. These methods are more than environmental assessment tools used by actors in the architectural and urban environment, but the key decisions in the design process of the building where these solutions are based on the results of these tools and methods. Researchers should have a wide knowledge on these techniques, the conditions of their use and their limits, in order to make the right choice of the appropriate methodology for the research and make sure to have the right results. This workshop aims to regroup researchers in different fields of research in architecture and urbanism offering them the opportunity to share their experiences in terms of tools and methods for assessing the built environment and clarify these techniques for junior researchers, especially for PhD students.

## **Studio 01: Architectural Scale: post occupancy evaluation' (POE):**

**Supervised by professors: Mezerdi Toufik / Bensmina Latoui/Boudouka Ayoub**

The present work concerns the Post occupancy evaluation (POE) as a tool to improve building performance, resulting in a built environment that better fits the needs of users. Design quality (DQ) and indoor environmental quality (IEQ) as performance indicators will be investigated through both subjective and objective measurements carried out in classrooms at the University of Biskra, Algeria. Measurements of the main descriptors of thermal, acoustical, air quality and visual comfort will be carried out and a questionnaire will be purposely developed, in order to investigate the students' perception on indoor environment quality and to analyze which are the subjective parameters most correlated with the experimental results.

## **Studio 02: Architectural Scale: Indoor lighting assessment:**

**Supervised by professors: Daich Safa / khelil Sara / Ahriz Atef / Daiche Ahmed Motie**

The proposed theme in "Studio 2" aims to exhaustively assess the indoor lighting in a built space. This workshop offers:

Firstly, a presentation as well as a round table to discuss, with all the participating doctoral students, the basic notions concerning natural lighting and its behavior in the building.

Secondly, an overview of the different methods, techniques and tools for this type of investigation will take place. Participants will have the opportunity to know these methods, the necessary measurement equipment in a similar study as well as the appropriate modes of interpretation.

Finally, an experiment will be proposed so that participants can master and apply the knowledge and methods received in a real environment. For this, a quantitative and qualitative study of the light environment on an architectural scale will be carried out at the level of the studios located at the department of Architecture of Biskra University. Numerical simulation, in situ measurements as well as a questionnaire form will be used. At the end of this experience, results and recommendations will be drawn.

**Studio 03: Urban Scale: Outdoor thermal comfort assessment:  
Supervised by professors: Bouzaher Soumaya/Matallah Mohamed Elhadi**

To improve the outdoor human thermal quality, researchers and field experts need to apply several scientific methods and specific technics for the assessment of the thermal conditions through the urban scale. Further, these technics are basically built on standard protocols applied by authorities and scientific institutions in worldwide continents. Therefore, the main objective of the studio 04, is to guide Ph.D students, field researchers and experts by understanding the urban climate investigations' methods and technics, which can be adapted to real projects in the Algerian context.

The studio 04 program includes the following stages:

- 1.Short demonstration of the urban climate investigation methods / approaches, and tools
- 2.Scheduling, and planification of the study purpose: area, time, duration, material, numerical tools, requested parameters ...
- 3.The choice criteria of the needed materials for the study.
- 4.Presentation of the used materials for the field measurements.
- 5.Starting the study in site (in the university campus) by forming small teams, which will record and characterize the investigated area.
- 6.Finishing the investigation in site by collecting all the requested parameters and indices.
- 7.Finally, perform the study outcomes and discussion to clarify thermal variations and correlations to their close built environment.

### 1) Dr. BENSMINA Latoui :

#### **Title: Analysis of urban systems: demographic or functional approach?**

Historically, the city was the gathering in the same place of people practicing different professions not related to the exploitation of the land. The city provided political, religious and commercial functions. Since 1800, the earth's population has quadrupled. However, the number of city dwellers has been multiplied by 25. There are 250 agglomerations in the world with more than one million inhabitants. One out of two men lives in a city. The acceleration of urbanization is due, in the countries of the North, to the industrial revolution. The city increases in surface by the creation of suburbs. Immense regions are urbanized in large agglomerations comprising several centers and extending over immense distances.

### 2) Dr. MEZERDI Toufik

#### **Title: Post occupancy evaluation: let the buildings speak.**

Post-occupancy evaluation (POE) is a process of estimating the performance of a building counting indoor environment quality (IEQ), energy performance and occupants' satisfaction after it has been occupied for at least several years. In this process, technical measurements can be made, and systematic surveys and interviews can be conducted with users in their environment. In this way, the performance of the building is measured, and a feedback can be provided to the facility manager and the entire technical team. This study focuses on a comprehensive and critical review to provide a both qualitative and quantitative introduction of Post-occupancy evaluation, including Post-occupancy evaluation definition and benefits, purposes, methods and protocols. Three surveys were conducted included in 3 papers, the first one concerns the concept of transparency in different regions in Algeria, the second focused on the impact of the socio-environmental quality of the courtyard house on occupant satisfaction: The case of M'chouneche oasis, and the last survey concerns the effect of greenery view on the perception of rooms' spaciousness and brightness: A survey on residents' point of view. The results of the three studies were exposed according to the POE purposes, methods and protocols.

### 3) Ahmed Motie DAICHE

#### **Title: Reverse simulation tools & daylighting design.**

**Keywords:** Architectural design, Reverse simulation, Daylighting systems, Experimental validation.

This contribution shows the opportunities of adoption of the reverse simulation method for the optimization of daylighting systems during the early steps of architectural design. The main objective is therefore to trace the various steps of the development of a numerical model of dimensioning opening-elements using reverse simulation of natural light into architectural space. The model was developed by following two steps: firstly, the calculation of the luminous environment by the combination of sky models and formulas. Based on these data, numerical calculation was performed using MATLAB® to generate the dimensions of an opening-element enabling to realize the daylight intentions of the designer. A method of comparative validation using standard software of daylight simulation and daylight optimization was subsequently adopted to test the reliability of the obtained

values. The model is therefore validated by practical way by an application in a real design situation by an experience with master students of architectural department. Results showed the opportunities that may offer a prospective integration of the developed model as pedagogical tool for the students' awareness about the importance of daylight design, visual comfort and the energy efficiency in the architectural design work.

#### **4) Dr. Daich Safa**

##### **Title: A combined method for assessing daylighting in buildings**

It is well known that a successful daylighting design should guarantee: 1) Sufficient quantity of light to ensure a comfortable environment appropriate to its use, 2) Visual performance to users while avoiding excessive brightness, high contrast, or intense sunlight reflections that can cause discomfort glare and 3) Pleasant indoor atmosphere adequate to visual tasks. On the other hand, recent research proved that a successful daylighting design can contribute to improving the building's overall sustainable performance by decreasing the need for electrical lighting. This paper aims to comprehensively evaluate the interior daylighting quality by employing multiple methods. The methodology consists of two parts. Firstly, in situ measurements of the physical lighting data were carried out, paired with HDR image techniques. Secondly, a questionnaire survey enabled the subjects' evaluation of the daylighting environment. This method aims to collect subjective information about indoor daylight quality and study the correlation between subjective and objective data. In this study, the survey was administrated in situ to obtain a general appreciation of the interior luminous atmosphere of the scale physical model, The sample chosen was homogeneous in age and educational level. The objective and the subjective data were then correlated to determine the most decisive parameter to optimize the daylight performance in buildings. In conclusion, the results show that subjective evaluations of lighting are a complement to objective photometric information where a positive and significant correlation should be obtained. In addition, a series of tests should be effectuated before starting the statistical analysis.

#### **5) Dr. Sara Khelil**

##### **Title: Parametric approach for architectural and urban investigations / assessments.**

**Keywords:** Architectural & urban design, Parametric design, Technology, investigations, Computation.

Technology is a major paradigm influencing the architectural projects, where in the last two decades architecture has undergone dramatic changes. The impact of digital technology on the building's sector is clearly noticed, and often related to the globalization. The building is influenced by the information and communication technology developments throughout its entire life cycle, not only from a process and technical point of view but also from a creative design and materialization point of view.

Architects and designers, while applying this technology in their designs, they change the way approaching the architectural design and architectural forms from finding process and manufacturing. In this case, computation will be used in all the phases of the building: design, construction and management. Therefore, the exploration and adoption of new techniques and methods for design and

manufacturing, including parametric design approaches, performance-based design approaches and digital manufacturing techniques, are necessary. The application of computational tools in the design process speeds the design process and offers to the designer a free space of imagination while exploring new complex building's shapes by integrating all the design phases into one comprehensive model.

Parametric design enables the exploration of alternative designs within a single representation using parameters and associative relationships to control geometric and constructive aspects of the design. In performance-based design, performance goals with respect to various aspects, such as comfort and structure, are explicitly developed and updated during the design, and assessed and guarded throughout the design process. Digital manufacturing enables innovative design exploration through physical prototyping during the design process, and mass-customization of non-standard architecture towards industrialization in a cost-effective manner.

Coupling the architectural design with parametric approach needs a transformation in modes of thinking which, would be the main agenda toward designers and architects. This research paper presents novel techniques that enhance architects' contribution to design processes based on parametric design creation. This allows a deeper comprehension of the design objectives and aids designers in their decisions to find solutions.

#### **6) Dr DAKHIA Azzedine**

**Title: Life Cycle Assessment, Environmental Analysis Tools for Buildings and Neighbour hoods.**

Building is considered to be the leading energy-consuming sector, and the second-largest energy-based greenhouse gas emitting sector after transportation. Buildings are often singled out as part of the fight against climate change(global warming). They are also responsible for other environmental consequences that seem to compromise the ability of future generations to meet their needs (depletion of resources, eutrophication of rivers, acidification of rains, and production of radioactive waste...).

#### **7) Dr saadi Mohamed yacine**

**Title: Image processing applied to architectural and urban research.**

**Keywords:** Lighting simulation, 3D Modeling, Lidar, HDRI images, SIG.

Modern digital technology has made it possible to manipulate multi-dimensional range and scales from indoor environment (cameras images) to the urban scale (satellite images). The presentation focuses on the fundamental concepts of image processing and their use in the architecture and urban investigation's; the presentation includes the application of the drone image and Lidar images in the 3D modeling and texturing. Presentation and case study of the Spatial Information Grid (SIG) was also introduced. From the relation among the processing time, and tool; used, we can achieve some

useful conclusions to determine the strategy of the image division quality and type (HDRI, TIF, Lidar).

### **8) Dr FEZZAI Soufiane**

#### **Title: Field survey, Data collection and aggregation.**

Data collection is an essential phase of an empirical study or a research project during which the student gathers information that will be analyzed to confirm (or not) the initial hypotheses and to answer a problem. Whether the research is seeking quantitative or qualitative data, it can be carried out using several techniques and helps the researcher understand the phenomenon, the fact, or the subject being studied.

employed methods and tools to achieve relevant data are usually divided into two categories, predictive or in situ data. Therefore, the relevance of the data collected and their correct interpretation in the analysis and conclusion will provide answers to the phenomenon studied and highly depends on the chosen method, the work protocol and the organization and representation of data. Thus, a correct and deep interpretation of the phenomenon. In this regard, the researcher needs to select the most suitable tools to represent the collected data (Graphs, maps, scatter plots, ...etc). some researches need calibration of measured data and predicted on, others require aggregation of several types on the same support, mainly extensive or multicriteria research.

This presentation deals with data collection tools and methods according to data type, passing by data representation, calibration and statistical tests.

### **9) Dr Mohamed Elhadi Matallah**

#### **Title: Technics of data acquisition for the objective to achieve thermal well-being within the outdoor spaces.**

Every single day, climate change consequences are spreading over the planet, whereas the overheating became critical to human body and has a significant impact on the people's thermal well-being, daily productivity and satisfaction. Our presentation is focusing on the most common scientific used technics in architecture and urban fields, to analyse quantitatively and qualitatively the human thermal interactions inside the built environment. Technics of investigation cover several tools such as: surveys, field measurements, numerical simulations, modelling and target many aspects such: environmental, human, buildings ...etc. which are largely conducted through the built environment engineering studies. Accordingly, the current presentation illustrates these technics and

their implications' cases specifically for urban climate studies, taking into account purposes behind researches questions.

#### **10) Dr. Ahriz Atef**

##### **Title: Elementaries of modeling & simulation in urban and architectural studies**

**Keywords:** Simulation, Modeling, Measurements, Variables, Error metrics.

In architectural and urban studies, several investigations tools are available to junior and senior researchers as the measurements, the surveys, technical reports and others. And among the extensive list of these tools, the modeling and simulation are the most used because of their ease of use, their high accuracy and their large spatio-temporal scale. In this presentation, elementaries of the modeling and simulation techniques are discussed, definitions, strategies and process steps are revealed and detailed.

From the measurements step to discussion of results passing by the validation of the selected model by the use of error metrics indices. Furthermore, several parameters are revealed, as well as the dependent and independent variables and the factorial plan theory, to state and organize the different scenarios.

#### **11) Dr. Ayoub Boudoukha**

##### **Title: Quantification of aeraulic parameters in residential cities.**

**Keywords :** les immeubles résidentiels ; les immeubles d'habitation urbains ; le microclimat urbain ; le confort éolien ; les espaces ouverts urbains.

Le microclimat des espaces ouverts résidentiels en particulier l'environnement éolien, est largement affecté par ses bâtiments environnants. Ce document vise à évaluer l'influence des bâtiments résidentiels sur le microclimat urbain dans la région du Nord-Est de l'Algérie. Cette évaluation a été réalisée à l'aide de mesures in situ de différents microclimats, en été et en hiver. En comparant deux cité résidentielles typiques existantes, la présente étude a montré que, les bâtiments les plus haut résultent des températures d'air basses, que soit en hiver et en été. De plus, le passage sous le bâtiment améliore l'accessibilité, la ventilation dans le coin intérieur du pâté de maisons, mais peut augmenter la vitesse du vent, ce qui cause de l'inconfort aux piétons et des problèmes de sécurité.

#### **12) Dr . Gabriela Fernandez & Carol Maione**

##### **Title: Urban Metabolism Methodological Tools**

**Keywords:** Urban metabolism; tools; application

## **12 ) Dr. karim Bouzir**

### **Title: Effect of urban morphology on road noise distribution**

The present research conducted in the city of Biskra focuses on the relationship that can exist between urban morphology and road noise distribution. Ten community-housing areas have been investigated in order to evaluate their noisescapes, using noise-mapping methods. The connection between the morphological characteristics and road noise distribution using Pearson correlation tests, showed a strong relationship between the two. The results of this research indicate that urban morphology has a significant impact on the noisescapes. Acoustic environment at urban scale represents therefore an important challenge for the urban designers and planners at early design stage for a sustainable and healthy urban environment.