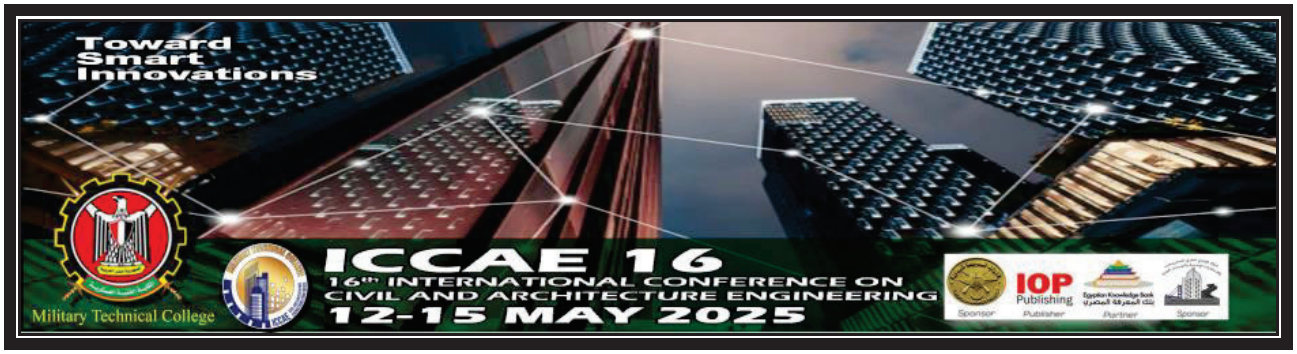
Arab Republic of Egypt
Ministry of Defense
Military Technical College

BOOKLET OF THE

16th International Conference on Civil and Architectural Engineering

ICCAE-16

12th - 15th May 2025



CONTENTS

1- PREFACE …

The Military Technical College is pleased to host the 16th International Conference on Civil and Architectural Engineering (ICCAE-16), sponsored by the Egyptian Ministry of Defence, from 12th to 15th May 2025.

The conference offers a valuable opportunity for specialists, engineers, and architects from the Egyptian Armed Forces to engage with their counterparts from universities, research centers, and academic or technical institutions—both within Egypt and internationally.

Our goal is to make the conference a platform for exchanging knowledge, presenting innovative ideas, and developing creative solutions that advance the fields of Civil and Architectural Engineering.

The conference aims to foster dialogue and share recent advances and experiences across a wide range of topics, addressed through thematic sessions covering the following areas:

I. Architectural Engineering …

a) Architectural Engineering.
b) Building Technology.
c) Environmental Engineering.
d) Urban Planning and Housing.

II. Civil Engineering …

a) Concrete Structures.
b) Geotechnical Engineering.
c) Material Quality & Control.
d) Metallic Structures.
e) Structural analysis & Design.
e) Structure Dynamics.
f) Surveying & Photogrammetry.
g) Transportation Engineering.

III. Project Management …

Out of the (94) full papers submitted to the conference, (51) were accepted, while the remainder were either rejected or withdrawn. All manuscripts underwent peer review and plagiarism screening.

The accepted papers were presented in 13 scientific sessions, alongside 3 keynote lectures and 2 workshops.

Finally, the Conference High Committee extends its sincere gratitude to all contributors, committee members, and session board members for their dedication and for helping ensure the successful delivery of the conference program.

BEST REGARDS,

Major General (R) Professor Dr. / Mohamed Ali Barakat

Conference Editor-in-Chief

2- COMMITTEES …

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- London South Bank University, UK
- Brunel University, UK
- Prince Sultan University, KSA.

4-KEYNOTE LECTURES, WORKSHOPS & SPEAKERS …

Keynote Lectures:

1) Keynote Lecture 1:

"Evolution of Risk Management in Project Development"

Dr. / Osama Elhamshary

PhD, P.E, PMP, CVS
Planning and Project Management Consultant, USA - EU

2) Keynote Lecture 2:

"Digital Twins & Urban Heritage Revitalization"

Maj. General Professor Dr. / Mohamed Fahmy Abdul Aleem

Staff member, Department of Architecture Engineering, MTC.
Engineering Authority of the Armed Forces.

3) Keynote Lecture 3:

"Hybridization of Public Libraries"

Dr. / Hossam Hewidy

Head of Architecture Major/MA programme, Aalto University – Finland
Senior University Lecturer, Urban and Regional Planning.

Workshops:

1) Workshop 1:

"New Innovations in Geotechnical Engineering"

Professor Dr. / Khalid Abdel-Rahman

Leibniz University of Hannover - Germany

2) Workshop 2:

Military Technical College
Department of Architecture Staff Members

"Towards Establishing an Integrated Sustainability Rating System"

Colonel Asst. Professor Dr. / Sherief Ahmed

Head of the Department of Architecture, Military Technical College

"Objective Scales in the Architectural Design Process"

Maj. General (R) Professor Dr. / Mohamed A. Barakat

Head of the Scientific Council, Department of Architecture,
Military Technical College

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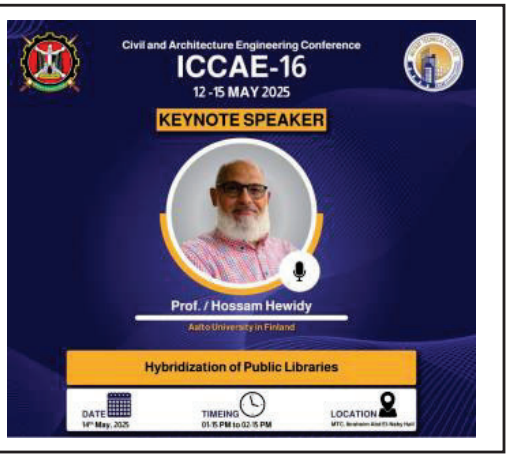
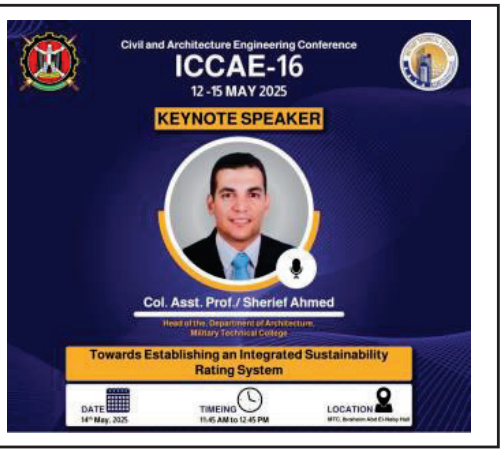
The 16th International Conference on
Civil and Architectural Engineering
12th - 15th May, 2025
https://iccae.conferences.ekb.eg/

Speakers:





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5- CONFERENCE PROGRAM …

I- Architectural Engineering Sessions.
II- Civil Engineering Sessions.
III- Keynote Lectures & Workshops.

I- Architectural Engineering Sessions.

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (1)**
Session Subject:	**Architectural Engineering & Building Technology**

Room: Major General / Ibraheim Abd El-Naby
Date: Tuesday 13/5/2025
Time: 9:00 - 10:15
Board: : Maj. Gen. Prof./ Ibrahim Gouda MTC
Col. Asst. Prof. Dr. / Sherief Ahmed MTC
Lt. Col. Dr./ Yasser Ibrahim MTC

Paper ID	Paper Title
ICCAE16-34-AE	Implementing vertical gardens in educational buildings to reduce energy consumption and achieve low carbon emissions Khloud ElDamshiry, A. Abu Bakr, M. E. ElAttar
ICCAE16-35-AE	Hybridizing Museum Practices: Proposed Design Guidelines for Hybrid Museums Dania Emad, Marianne N. Guirguis
ICCAE16-50-AE	A Green Concrete Mixture Using Rice Husk As Partially Cement Replacement Zeina Salama, Ayatallah Raafat, Khloud ElDamshiry, Amany Micheal, Rania Moussa
ICCAE16-66-BT	Advances in Construction Engineering: Exploring the Potential of 3D Printing Mariam AlaaEldin, Ahmed Elyamany, Emad Elbeltagi, Ahmed Osama Daoud

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (2)**
Session Subject:	**Project Management I (Architectural Papers)**

Room: Major General / Ibraheim Abd El-Naby
Date: Tuesday 13/5/2025
Time: 11:45 - 13:00
Board: Dr. Osama El-Hamshary — Plann. & P. Manag. Consult
Asst. Prof. Dr. / Venees Faid Gerguis — ERU
Col. Asst. Prof. Dr. / Abbas Atef Hassan — MTC

Paper ID	Paper Title
ICCAE16-36-PM	Smart Contracts towards Reducing Disputes in Construction Projects in Egypt N. Nada, Ayman A. E. Othman
ICCAE16-37-PM	Change Management Towards Enhancing Competitive Advantage Through Embracing Technological Innovation in Architectural Design Process M. Alfeky, Ayman A. E. Othman
ICCAE16-44-PM	Cloud-Based Computing System for Improving Collaboration During the Design Process: An Investigative Study R. Rashad, Fatma O. Alamoudy
ICCAE16-55-PM	Promoting Tourism through Sustainable Adaptive Reuse of Heritage Buildings in Developing Countries N. A. Hassan, Fatma O. Alamoudy

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (3)**
Session Subject:	**Project Management II (Civil Papers)**

Room: Major General / Abd El-Hameed Shawky
Date: Tuesday 13/5/2025
Time: 14:00 - 15:15
Board: Professor Dr./ Ayman A. E. Othman BUE
Asst. Prof. Dr. / Ahmed O. Daoud BUE

Paper ID	Paper Title
ICCAE16-18-PM	Applying a revised six-stage value engineering job plan in Egyptian banking sector construction projects to optimize cost efficiency and improve value Khaled Salem, Abbas Atef Hassan, Mohamed Ali Elsayed, Ayman Halabya
ICCAE16-71-PM	BIM integration for cost management included inflation & market volatility Mohamed Ezzat, V. F. Gerges, A. Elsharkawy, Abbas Atef Hassan
ICCAE16-82-PM	Analysis and prediction of Canadian construction industry demand Ahmed Abd El-Rady Okasha, Mohamed El-Nady, Ahmed Hammad

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (4)**
Session Subject:	**Urban Planning & Housing - Building Technology**

Room: Major General / Ibraheim Abd El-Naby
Date: Tuesday 13/5/2025
Time: 13:15 - 14:30
Board: Maj. General Prof. Dr./ Mohamed Fahmy MTC
Brigadier Dr./ Hesham A. El-Kadi MTC
Col. Dr. / Hany M. Mokhtar MTC

Paper ID	Paper Title
ICCAE16-41-UPH	Crypto-Driven Solutions: Transforming Mobility through Block chain for Smartness & Sustainability Sara Tarek
ICCAE16-24-UPH	Empowering Egyptian Neighborhoods with the 15-Minute City Concept Farah Sherif Shabana, Marwa Adel El Sayed,
ICCAE16-25-UPH	Heritage Sites in Digital Age: New Pathways to Sustain Cultural Identity Raneem Mohamed, Marwa Adel El Sayed, Aya Said
ICCAE16-63-BT	A Machine Learning Approach to Cooling Load Prediction: Integrating Orientation-Specific U-Values with Random Forest Modelling Nourhan Waly, Hatem Mahmoud

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (5)**
Session Subjects:	**Urban Planning & housing** **Environmental Engineering**

Room: Major General / Abd El-Hameed Shawky
Date: Wednesday 14/5/2025
Time: 9:00- 10:15
Board:
Dr. / Hossam Hewidy — Aalto Univ.
Dr./ Hebatullah Ghalib — Ain Shams Univ.
Col. Dr. / Hany M. Mokhtar — MTC

Paper ID	Paper Title
ICCAE16-23-UPH	Assessing Public Vs. Professionals' Aesthetic Preferences of Public Art Initiatives in Informal Areas: The Case of the Ring Road in Cairo, Egypt Yomna Lotfi, Mona Helmy, Husam Bakr Khalil, Menatallah Abdulmuteleb
ICCAE16-26-UPH	Exploring the X-Minute City: A Chronological Analysis and Thematic Review of Proximity-Based Urbanism Gehad Megahed, Abeer Elshater, Mohab Elrefaie, Samy Afifi
ICCAE16-38-EE	Assessing the Impact of Air pollution on Masonry Walls of Muhammad Ali Palace in Cairo Using Spectrum Analysis Mona Azouz, Marian Nessim, Dina Salem, Ayman Hamed, Fayrouz Ashraf
ICCAE16-30-EE	Sustainable Indoor Thermal Comfort Optimization in Public Buildings and its Impact on Occupants' Wellbeing Farah Hafez, Walaa Ismaeel, Ashraf A. Nessim

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (6)**
Session Subject:	**Architectural Engineering**

Room: Major General / Ibraheim Abd El-Naby
Date: Wednesday 14/5/2025
Time: 9:00- 10:15
Board Maj. General Prof. Dr./ Mohamed A. Barakat MTC
Asst. Prof. Dr. / Ashraf A. Nessim Ain Shams Univ.
Col. Asst. Prof. Dr. / Sherief Ahmed MTC

Paper ID	Paper Title
ICCAE16-60-AE	Thermal, energy and daylighting performance of solar envelope courtyard blocks in Cairo, Egypt Yasser Ibrahim
ICCAE16-2-EE	Indoor thermal comfort in temporary building units, case study in Egypt Habiba Khaled Mohamed Mabrouk, Walaa Ismaeel, Nourhan El-Akkad
ICCAE16-73-AE	Day lighting optimization of double skin facades' perforation and shape in office buildings, in Cairo, Egypt Ahmed Ashraf Khamis, Yasser Ibrahim, Mahmoud A. El-khatieb
ICCAE16-72-AE	Daylight Performance-Based Design Model for Bio-adaptive Building Skin for Office Space of Administrative Buildings in Egypt Nadeen Wael, Waleed Zakria, Mahmoud A. El-khatieb, Mohamed Mahdy

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (7)**
Session Subject:	**Architectural Engineering & Urban Planning**

Room: Major General / Ibraheim Abd El-Naby
Date: Wednesday 14/5/2025
Time: 10:30- 11:45
Board: Professor Dr./ Dalila El-Kerdany AUC
Professor Dr. / Germin El-Gohary Ain Shams Univ.
Maj. General Prof. Dr./ Mohamed A. Barakat MTC

Paper ID	Paper Title
ICCAE16-6-AE	Heritage Value Mapping: An Automated Tool for Visual Assessment and Conservation Enhancement Joyce Sherif, Ava Said, Reem Adel, Gehan Nagy
ICCAE16-21-UPH	Policy Framework for Sustainable Aqua Sites Development in South Sinai Kamal Ibrahim, Rasha Sayed, M. Samra
ICCAE16-14-AE	Framework for Enhancing Heritage Buildings Sustainability Value by the Integration of Green Retrofitting Methods Eman Ayman, Laila A. Elsawaf, Gehan Nagy
ICCAE16-27-UPH	Scenario Planning in Spatial Planning Education: A Cross-Border Perspective Hossam Hewidy

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session No.:	**Session (8)**
Session Subject:	**Architectural & Environmental Engineering II**

Room: Major General / Ibraheim Abd El-Naby
Date: Wednesday 14/5/2025
Time: 14:30- 16:00
Board: :Maj. General Prof. Dr./ Ehab Hanafi Mahmoud MTC
Brigadier Asst. Prof. Dr./ Mohamed M. Mahdy MTC
Lt. Col. Dr./ Yasser Ibrahim MTC

Paper ID	Paper Title
ICCAE16-19-EE	Examining the pedestrian-level wind environment around high-rise buildings using CFD simulations. Effect of Height and Shape. Abdul Rahman Mohey, Sherif Ahmed, Hany M. Abdul Khalek , Mohamed A. Barakat
ICCAE16-68-AE	Enhancing educational indoor day lighting performance using parametric adaptive facade design Waleed Al-kadi, Hesham El-kady, Mohamed M. Mahdy
ICCAE16-5-EE	Hydroponic planted roofs as a tool to improve socio-economical sustainability and living conditions. a case in middle-income communities Hosam Abd El- Aziz Amr, Amira Mohamed Mahrous, Sara Essam Tageldin
ICCAE16-42-AE	Hydroponic Green Walls as a Sustainable Solution for Thermal Comfort and Energy Efficiency in office buildings Hossam Abd El-Aziz Amr, Maya Hisham

II- Civil Engineering Sessions.

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject: Structure I

Room: Major General / Abd El-Hameed Shawky
Date: Monday 12/5/2025
Time: 12:00 - 13:45
Board: Maj. Gen. Prof. / Sherif Mazik — EA
Maj.Gen.Prof. / Nabil Hussein — MTC
Prof. / Mohamed Elghandor — Portsaid Uni.

Paper ID	Paper Title
ICCAE16-57	**Prediction of Progressive Collapse For Multi-Storey Steel Moment Frames Using Machine Learning Algorithms** Amr Mansour, Ahmed Nabawe, AbdElMoniem Bayoumi , Mohammed Hassanien Serror and Sherif Ahmed Mourad
ICCAE16-65	**Experimental Investigation of the Improvement of R.C Beams Under Pure Torsion** M. A. Yusuf , Nabil. M. Nagy , A. Osman , M. S. Zahran
ICCAE16-84	**Experimental Investigation Of high strength Geopolymer Concrete Under Fire Resistance** Mohamed Gamal, Moustafa Abdelwahab, Ahmed Hassan, M. S. Zahran.
ICCAE16-67	**Design and Implementation of Ultra-High-Performance Fiber Reinforced Concrete Mixtures** Khalid Mo. Awad , Essam Eltehawy

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject: Transportation Engineering – Surveying Engineering

Room: Major General / Abd El-Hameed Shawky
Date: Tuesday 13/5/2025
Time: 8:30 - 10:15
Board:

Maj. Gen. Prof. / Ossama Moursy	MTC
Brig. Assoc. Porf./ Ahmed Shawky	MTC
Assoc. Prof. / Ahmed Gamal	Banha Uni.

Paper ID	Paper Title
ICCAE16-11	A Novel Approach for Digital Building Modeling Using LiDAR and Image Data Integration Hany Abdel-Maksoud, Tarek Abdel Aziz, Ahmed S. Elsharkawy and Osama Morsy
ICCAE16-75	The Effect of Runway longitudinal Slope on Determining Takeoff Distance for Fixed Wing Aircrafts Abdel Latif G.A.L. Younes
ICCAE16-80	Optimizing Railway Network Capacity: Analytical Approaches and Case Study Insights M.F. El-Sayed, H.N. Zohny and M.S. Zahran
ICCAE16-39	Comparative Study of Full-Depth Reclamation Pavement Performance Using Different Cement Types Mohamed Sabry Abdelsamd Abo-Elnsr , Prof.Dr. Osama Morsi , Dr. Alaa Aldin Mohamed and Dr. Ahmed Gamal Mahmoud Morsi

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject:	**Geotechnical Engineering - Transportation Engineering**

Room: Major General / Abd El-Hameed Shawky
Date: Tuesday 13/5/2025
Time: 10:30 - 12:15
Board:

Maj. Gen. Prof. / Nabil Nagy	MTC
Prof. Marwan Shahin	Tanta Uni.
Assoc. Prof. / Ahmed Gamal	Banha Uni.
Lt. Col. Dr. / Ahmed El-Shesheny	MTC

Paper ID	Paper Title
ICCAE16-70	**Pavement Performance Indicators: Measurements, Applications, and Limitations.** Hossam El-Din Fawzy, Ahmed Mohamdy Abdallah, Ali Basha, and Ehab Elgamal
ICCAE16-16	**Impact of Projectile Weight and Apex Angle on Penetration Depth in Sandy Soils** Abdul-Rahman Khaled Osman, Ahmed ElSheshieny, Mohamed Zahran, Nabil Mohamed Nagy
ICCAE16-9	**Modeling Road Safety for signalized crossings in urban Roads Case Study: Corniche Road - Alexandria, Egypt** Wael Bekheet , Mohamed T. Azab , Ahmed Anees
ICCAE16-29	**Enhancing Ferro-cement Slabs with Industrial Slag and Nanoscale By-products for Sustainable Construction** Mohamed Taha Abou Elenain , Osama M. Moussa , Yousry B. Shaheen, Ahmed Gamal Mahmoud Morsi

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject:	**Material Quality & Control**

Room: Major General / Abd El-Hameed Shawky
Date: Wednesday 14/5/2025
Time: 10:30 - 12:15
Board:

Professor/ Yousry Shahin	MU
Brig. Assoc. Prof. / Ahmed Hassan	MTC
Col. Assoc. Prof. / Mohamed Ali	MTC

Paper ID	Paper Title
ICCAE16-64	**Assessing The influence of EAFS on Alkali Activated Mortar: Mechanical Properties, Chloride Penetration, and Elevated Temperatures** Ramy A. Mohamed , Nabil H. El-Ashkar and Ali H. Shalan
ICCAE16-69	**A study to investigate the compressive strength and flow of alkali activated slag mortar using two curing regimes** Mostafa Elsebaei, Maria Mavroulidou, Maria Centeno, Rabee Shamass , Ottavia Rispoli , Amany Micheal
ICCAE16-79	**Experimental study on partial replacement of fine aggregate by surkhi** S. A. Ibrahem, Osama. M. Moussa , A. Osman3, A. Gamal
ICCAE16-52	**Transforming Defective Collapsed Concrete into Recycled Aggregate for Sustainable Concrete Production: A Case-Study on Coastal Land Reclamation Using Geo-tube Technology in Gaza** Nesreen Elawadly

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

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12 – 15 May 2025

Session Subject:	**Structures II**

Room: Major General / Abd El-Hameed Shawky
Date: Wednesday 14/5/2025
Time: 13:00 - 13:45
Board:

Maj. Gen. Dr. / Hasan Farag	MTC
Prof. Amany Micheal	BUE
Brig. Dr. / Mohamed Abou El-Seoud	AFTRC
Col. Assoc. Prof. / Mohamed Zahran	MTC

Paper ID	Paper Title
ICCAE16-3	**A Comparative Study on Blast Resistance of Traditional/Developed Lightweight Protective Layers** Sherif M. Elamash, Ahmed Shawky, Mohamed A.E.M. Ali and Mohamed Rashad
ICCAE16-22	**Seismic Response of Multi-Storied Steel Building with Various Configurations Resisting Systems in Seismic Zone V in Egypt** Mohamed M. Shabib, Hassan M. Farag, Yasser A. Khalifa, M. S. Zahran
ICCAE16-58	**Auxetic Metamaterials for Seismic Wave Mitigation: A State-of-the-Art Review of Recent Literature** Bahy Y Elgendy, Aya Elhozayen
ICCAE16-78	**The Role of Non-Structural Elements in Progressive Collapse Resistance: A Review of Partitions and Facades Under Extreme Loading Conditions** M Ehab, M Ahmed , H Ibrahim

III- Keynote Lectures & Workshops.

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject:	**Keynote Lectures 1 & 2**

Room: Major General / Ibraheim Abd El-Naby
Date: Tuesday 13/5/2025
Time: 10:30- 11:30 & 14:45 - 16:00
Board: Maj. General Professor Dr. / Mohamed Ali Barakat MTC
Brigadier Dr./ Hany Abdul Khalek MTC

Lecture ID	Lecture Title	Time
KL1	Evolution of Risk Management in Project Development Dr. / Ossama El-Hamshary PhD, P.E, PMP, CVS Planning and Project Management Consultant, USA - EU	10:30- 11:30
KL2	Digital Twins & Urban Heritage Revitalization Maj. General Professor Dr. / Mohamed Fahmy Abdul Aleem Staff member, Department of Architecture Engineering, MTC. Engineering Authority of the Armed forces.	14:45 - 16:00

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject:	**Keynote Lecture 3**

Room: Major General / Ibraheim Abd El-Naby
Date: Wednesday 14/5/2025
Time: 13:15 - 14:15
Board: Maj. General Professor Dr. / Mohamed Ali Barakat MTC
Brigadier Dr./ Hany Abdul Khalek MTC

Lecture ID	Lecture Title	Time
KL3	Hybridization of Public Libraries Dr. / Hossam Hewidy Head of Architecture Major/MA programme, Aalto University – Finland Senior University Lecturer, Urban and Regional Planning,	13:15 -14:15

The 16th International Conference on Civil And Architectural Engineering ICCAE-16

Military Technical College

12 – 15 May 2025

Session Subject: Workshops W1 & W2

Room: Major General / Abd El-Hameed Shawky
Date: Tuesday 13/5/2025
Time: 12:30 - 13:45
Board: Maj. General Professor Dr. / Ossama Moursy MTC
Colonel Asst. Prof. Dr. / Mohamed Zahran MTC

Lecture ID	Lecture Title	Time
W1	"New Innovations in Geotechnical Engineering" Prof. / Khalid Abdel-Rahman Leibniz University of Hannover Germany	12:30 – 13:45

Room: Major General / Ibraheim Abd El-Naby
Date: Wednesday 14/5/2025
Time: 12:00 – 13:00
Board: Maj. General Professor Dr. / Mohamed Ali Barakat MTC
Brigadier Dr./ Hany Abdul Khalek MTC

Lecture ID	Lecture Title	Time
W2	Military Technical College Department of Architecture Staff Members "Towards Establishing an Integrated Sustainability Rating System" Colonel Asst. Professor Dr. / Sherief Ahmed "Objective Scales in the Architectural Design Process" Maj. General (R) Professor Dr. / Mohamed A. Barakat	12:00 - 13:00

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6- Abstracts …

I- Architectural Engineering.
II- Civil Engineering.
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I- Architectural Engineering.

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Heritage Value Mapping: An Automated Tool for Visual Assessment and Conservation Enhancement

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Abstract. Heritage buildings hold historical, cultural, and traditional significance, making their preservation crucial for future generations. However, when the intrinsic values of these buildings are not fully recognized, it can lead to the loss of important features and wrong retrofitting strategies. This study aims to develop a "Reading Value Map" which is a map for assessing and determining the value of heritage buildings visually checking various components linked to each value, which leads to better understanding of heritage's significance. Both qualitative and quantitative methods were employed in the study. First, an extensive literature review was conducted to outline the different values associated with heritage buildings, detailing their components and the tools used for their evaluation. This resulted in the creation of the Reading Value Map. Second, both regional and international case studies were examined to validate the applicability of the proposed Reading Value Map for heritage buildings across various locations, regardless of geographical context. The case study results confirmed that the Reading Value Map was successful in assessing the values of heritage buildings through visual evaluation alone. This approach reliably identified the presence of values when compared to outcomes from using technological tools. Finally, The Reading Value Map can be developed into an automated tool to improve accuracy, guiding architects in visualizing the extent of each value using charts.

Keywords. Cultural Heritage Conservation; Architectural Heritage; Heritage Value Assessment; Visual Evaluation; Reading Value Map; Automated Heritage Tools

Framework for Enhancing Heritage Buildings Sustainability Value by the Integration of Green Retrofitting Methods

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Abstract. Heritage buildings have a significant role in cultural identity and historical significance preservation. Heritage buildings face several challenges due to outdated construction methods, and lack of sustainability. The main challenge is to preserve the heritage building historical and cultural integrity while retrofitting these buildings to increase their sustainability value. The main aim of this study is to develop a comprehensive Framework for Enhancing Heritage Buildings Sustainability Value by the Integration of Green Retrofitting Methods. This study adopts quantitative and qualitative method approach. Research methods consist of theoretical and applied studies, which discuss and study heritage buildings value, various retrofitting strategies, assess their impact on sustainability, and explore case studies that adopt the retrofitting strategies. As the research study aims to bridge the gap between the preservation and sustainability, the results obtain that following the proposed framework will guide the practitioners efficiently for successful retrofitting process of a heritage building in matter of sustainability.

Keywords: Heritage Buildings, Sustainability Value; Green Retrofitting; Conservation; Cultural Significance; Building Deterioration

Implementing vertical gardens in educational buildings to reduce energy consumption and achieve low carbon emissions

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Abstract. Nowadays, the change of climate has been a crucial problem for architects to address since buildings consume more than half of the energy that results in carbon dioxide emissions that contribute to climate change. Vertical gardens have been proven in studies to be capable of significantly offsetting carbon dioxide emissions from building. in addition to passively cooling and insulating the structure As a result, the energy required for building operation is lowered in what appears to be a butterfly effect. The bulk of non-residential buildings in Egypt have been built without regard for energy efficiency regulations in recent years. As a result, mismatched designs are frequently responsible for environmental problems. Energy usage is influenced by building design (form, orientation, and building materials), as well as operational and space utilization factors. Because non-residential buildings are among the most carbon-intensive structures, greening current structures to achieve zero-carbon status is far more efficient than greening new ones. This study investigates if adding vertical gardens in Cairo buildings might serve as a passive cooling load reduction approach. This is accomplished by calculating the building energy required for cooling load, carbon dioxide emissions from cooling load, cooling load reduction made by vertical gardens, and CO2 sequestered by vertical gardens, with the goal of providing a guide that quantifies the vertical gardens system's efficiency to minimize energy usage and carbon dioxide emissions. Through simulation, it was found that living walls with mentha and spicata could reduce as much as 6200 watts and offset 5204kg of carbon dioxide emission.

Keywords. Climate Change, Urban Heat Island, Vertical Green System, Energy Efficiency, Low Carbon, Carbon Sequestration, Educational Buildings.

Hybridising Museum Practices: Proposed Design Guidelines for Hybrid Museums

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Abstract. According to advancements in this century, technology has transformed the way cultural institutions operate, particularly within the museum sector. It is being integrated into hybrid museums to enhance the experiences of various generations, improving their engagement levels. Hybrid museums blend physical and digital environments by incorporating tools such as Extended Reality (XR), touchscreens, holograms, projection mapping, gamification platforms, digital guides and panoramic displays to create immersive experiences that engage visitors innovatively. Despite the growing acceptance of technology and its positive influence on audiences, Egyptian museums present a limited integration of digital tools in museums, restricting their development in this domain. Hence, the aim of this research is to develop comprehensive design guidelines for hybrid museums, enhancing the immersive experiences of visitors and paving the way for future museum innovations in Egypt. A mixed-methods approach, combining quantitative and qualitative methods, was employed. Previous literature reviews were examined to identify effective digital tools for hybrid exhibitions and the design features supporting their integration. As a result, design guidelines were developed and subsequently validated through the authors' onsite observation of hybrid museum design elements, followed by observational case study analysis of a museum in Dubai as a country in the Arab Region.

Keywords: Hybrid Museums; Digital Tools; Design Guidelines; Museum Digital Transformation; Interactive Museum Tools; Museum Digitization; Museum Hybridization

Hydroponic Green Walls as a Sustainable Solution for Thermal Comfort and Energy Efficiency in office buildings

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Abstract. Since Egypt is urbanizing rapidly, office buildings suffer from severe thermal comfort and energy efficiency issues. Poor insulation and high temperatures result in heavy energy consumption in cooling. This study proposes the application of hydroponic green walls to enhance thermal performance and aesthetics in urban office buildings. With these exterior walls integrated into building facades, issues of heavy energy consumption due to poor insulation and high temperatures are resolved. Hydroponic green walls not only enhance insulation and energy consumption but also render working conditions greener and more productive. Both qualitative and quantitative methods are employed by this study in evaluating their efficiency. Qualitative study involves an exploration of green wall systems, hydroponic systems, and the environment considerations toward formulating an initial guideline. Quantitative study tests and validates the applicability of this guideline with case studies. This study ultimately seeks to develop a validated model of achieving higher efficiency in Egypt's office buildings through reduced energy and water consumption, as well as enhanced thermal performance and aesthetics.

Keywords: Hydroponic Green Walls, Thermal Comfort, Sustainability

A Green Concrete Mixture Using Rice Husk As Partially Cement Replacement

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Abstract. Egypt's agricultural waste production has increased significantly in recent decades, leading to improper disposal methods and environmental pollution. Rice husks are the most common agricultural solid waste in Egypt, contributing to "black clouds" and causing health issues. On the other hand, Cement, a crucial component of construction materials, generates unsound residues and greenhouse gas emissions. Green concrete with rice husks could be a profitable solution for environmentally sound construction, reducing cement consumption and increasing the durability and integrity of new materials. This study investigates the use untreated rice husk fibres with a concrete mixture, avoiding burning and contributing to environmental pollution. Experimental work involved partial substitution of cement with rice husks in 4%, 6%, and 8%. The results showed that partially replacing cement with 4% untreated rice husk preserved reasonable compressive strength of 16.11 MP, improved thermal insulation by reducing thermal conductivity by 2.69%, and lowered production costs by 2.25%.

Keywords: Rice Husk (RH), Cement, Green concrete, Black cloud, carbon emission (co2).

Thermal, energy and daylighting performance of solar envelope courtyard blocks in Cairo, Egypt.

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Abstract. Courtyard buildings are acknowledged for their thermal benefits in hot-arid regions. However, the design for thermal performance in these regions often entails compact urban forms, compromising other environmental qualities, e.g., daylight availability. This paper presents the Solar Envelope Block (SEB) as a sustainable urban form in hot-arid regions, by addressing the drawbacks of a Conventional Courtyard Block (CCB). The study uses ENVI-met to account for the thermal performance, as well as Ladybug-tools for Grasshopper/Rhino, to account for the energy and daylight performance of both typologies. The performance metrics, air temperature and wind speed, calculated by ENVI-met on a typical hot summer day, are extrapolated as EnergyPlus boundary conditions for energy calculations over the summer season. Further, spatial Daylight Autonomy (sDA) is calculated by Radiance to compare their annual daylight availability. The results show that SEB's are on average 1°C lower, and 0.6 m/s higher throughout the day. Boundary conditions adjustments show improvements in cooling loads by almost 14%, compared to basecase conditions. Daylight analysis shows respective improvements of 16% and 69%, in SEB's electrical loads, and daylight availability, over CCB's. The study concludes SEB's sky openness is more favourable to the overall environmental performance.

Keywords: Solar envelope, Thermal comfort, Energy loads, Daylighting, Courtyards.

Enhancing educational indoor daylighting performance using parametric adaptive facade design

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Abstract. This study used a genetic algorithms research methodology to examine various design parameters for attaining a balance between daylight availability and visual comfort in educational facilities utilizing a double skin facade (DSF) inspired from mashrabiya. This encompasses its perforation ratio, depth, gap width from the external wall and inclination angels. The research pertains to the protocols and performance indicators of the most recent Leadership in Energy and Environmental Design system. Simulations of point-in-time illumination (PIT) were conducted. Results have shown that the preferred perforation ratios are: - (70%) in summer and (50%) at winter. preferred inclination angels: - (From 75 :120 degrees at 9AM, From 15:135 degrees at 3PM, From 75 :120 degrees at 3PM) at summer, (135 degrees at 9AM, From 105 to 135 at 12 PM, 135 degrees at 3PM) at winter.

Keywords: Architecture; Adaptive façade; Double skin façade; Parametric design; Genetic algorithms; Sustainable architecture; Indoor environmental quality; Educational indoor quality; International style

Daylight Performance-Based Design Model for Bio-adaptive Building Skin for Office Space of Administrative Buildings in Egypt

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Abstract.

Daylight Discomfort Glare (DDG) limits the effectiveness of natural light in office spaces, particularly in Cairo's hot climate, where varying sun angles throughout the day impact visual comfort. The research provides a parametric design tool that integrate building skin designs based on user specified parameters, a daylighting simulation engine that assesses daylighting performance using a single point-in-time method for each design variant, and an optimization tool that helps identify the most optimal design solution based on maximizing daylighting performance while reducing (DDG) for southern orientation in Egyptian office buildings. Through seasonally adaptive design, this study demonstrates how effectively biomimetic building skin can enhance indoor visual comfort. Across four specific test points, the proposed system reduced glare by up to 31% while maintaining indoor illuminance levels within the recommended range of 500–2000 lux compared to an unshaded base case. For June, a 90% perforation ratio with a 20 cm shading extrusion proved most effective, offering a balanced approach to daylight access and glare mitigation, especially in the morning and afternoon, while medium ratios performed better at noon. In December, perforation ratios of 50–60% combined with a 30 cm extrusion effectively blocked low-angle sunlight and reduced glare.

Keywords: Bio-adaptive skin, daylighting performance, parametric design, building envelope design.

Daylighting optimisation of double skin facades' perforation and shape in office buildings, in Cairo, Egypt.

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Abstract. Natural daylighting is a key indicator of how occupants are satisfied with their visual environment. Modern architectural facade designs are often characterized by ample transparent surfaces, thus an indeliberate design could encounter daylighting deficits or surplus. In Egypt, southern facades are over lit almost all year-round, and utilizing perforated double skin facades is one design strategy that helps achieve occupant's visual comfort, only if subtly designed and allocated. There have been several studies on the daylighting performance of perforated double skin facades, but only few have considered the design of their shape or perforation ratio, especially in Egypt. This paper aims to optimize the daylighting performance of perforated screens in office buildings in Egypt. For doing so, the study uses parametric design techniques to define the optimum perforation shape and ratio of a non-uniformly perforated screen of an office space, in Cairo. Performance metrics are the task plane illuminance and daylighting distribution, calculated on each solstice/equinox during three occupancy points in time. The results show that a total perforation ratio (PR) of 30% of rectangular shapes, most perforated around the fringes than the centre, achieve the optimal daylighting distribution of up to 83% in all seasons. Circular and triangular shapes with a PR of 27.5 and 26.2%, respectively, achieve a daylighting distribution of 85 and 75%, only in certain seasons.

Keywords: Daylighting, Parametric optimization, Double-skin-facade, Perforation ratio.

A Machine Learning Approach to Cooling Load Prediction: Integrating Orientation-Specific U-Values with Random Forest Modelling

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Abstract. Accurate cooling load prediction is crucial for the design of energy-efficient buildings. This study proposes the development of a predictive model for cooling load based on the building orientation and envelope (represented by U-values) using machine learning algorithm. A physics-based simulation approach, combined with optimization outputs, was employed to generate data for training and evaluating the predictive performance of the machine learning (ML) model: Random Forest (RF). Key optimization features include the U-values of external walls across different façade orientations (South, West, East, North) and the Roof. Results indicate that South and West U-values exhibit the strongest correlation with cooling load, whereas Roof U-values have the least impact. the tested models RF demonstrated high accuracy, achieving an R^2 score of 0.934. The findings confirm that cooling load is highly dependent on envelope insulation properties, and RF model can effectively predict it based on thermal transmittance characteristics. This study underscores the importance of ML-based methods which significantly reduce computational time which encourage more stakeholders such as designers and policymakers to produce more energy efficient buildings.

Advances in Construction Engineering: Exploring the Potential of 3D Printing

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Abstract. The construction industry is undergoing a transformation with the rise of 3D printing technology, offering cost-effective, efficient, and environmentally sustainable building solutions. This paper presents a systematic review of 3D printing in construction, focusing on its technological evolution, material advancements, and implementation barriers. An analysis of academic research from 2020 to 2025 highlights current trends, including multi-material systems and AI integration, and identifies critical challenges such as regulatory gaps and material limitations. The study synthesizes global case studies to evaluate feasibility, efficiency, and sustainability metrics. The findings highlight the expanding global interest in 3D printing, demonstrating its increasing viability for scalable industry applications, ranging from residential to infrastructure projects. Ultimately, this study contributes to advancing the integration of 3D printing in modern construction practices, emphasizing its potential to improve construction timelines, reduce resource consumption, and enhance project delivery.

Keywords: 3D Printing in Construction, Additive Manufacturing, Sustainable Construction, Construction Industry Trends.

Indoor thermal comfort in temporary building units

Case study in Egypt

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Abstract. Temporary building units (TBUs) have become increasingly prevalent for diverse applications, however, their lightweight construction often leads to thermal discomfort for occupants, especially in extreme climates. Thus, this research investigates the selection of different materials for building elements (wall, floor and roof types) to achieve thermal comfort in TBU. Another research aim is to optimize designs through simulation models using Design Builder, which included eight simulations to assess the building's total site energy consumption and the number of unmet hours. The initial phase focused on wall materials—comparing PVC, fiberglass, and plywood—where plywood was identified as the most suitable option. The subsequent simulations assessed three types of flooring: plywood, vinyl, and fiberglass, with plywood again emerging as the preferred choice. Finally, the roof options were evaluated for the metal and green roofs, with the green roof demonstrating greater effectiveness. This is beneficial for designers and developers of TBUs to achieve indoor thermal comfort.

Keywords: Building simulation; Floor design; Indoor thermal comfort; Roof design; Temporary building units; Wall design

Hydroponic Planted Roofs as a Tool to Improve Socio-Economical Sustainability and Living Conditions.

A case in middle-income communities.

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Abstract. This study explores the potential of hydroponic systems in addressing climate change by promoting urban food systems, encouraging community involvement, and enhancing thermal comfort. It focuses on middle-class areas in Egypt and uses a comprehensive analysis of literature, defining hydroponic systems, and explaining seeds growing medium. Empirical techniques, including structured interviews with 12 Egyptian hydroponic experts (with 4–15 years of experience), are used to verify the conclusions drawn from the literature, focusing on sustainability, system components, and crop selection criteria. Comparative studies are conducted to assess the socio-environmental advantages of hydroponic case studies. AI simulation techniques were performed using Climate Studio for Rhino, modeling building performance and evaluating the impact of hydroponic systems on indoor thermal comfort and energy consumption. The results demonstrate significant socio-economic and environmental advantages of hydroponic systems, providing useful information for sustainable design guidelines. The research advances urban agriculture techniques tailored to the unique challenges faced by middle-class communities in Egypt, enhancing the resilience of the country against climate change.

Examining the pedestrian-level wind environment around high-rise buildings using CFD simulations. Effect of Height and Shape.

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Abstract. The environmental quality of living spaces is an important issue that affects the superiority of life and the satisfaction of their inhabitants. Several factors control and affect this issue, such as temperature, humidity, sound, visual comfort, and others. One of the important factors that severely affects the quality of urban environments is the wind speed effect, especially in urban environments that are dominated by high-rise buildings.
Strong winds at a pedestrian level can endanger human safety, disrupt outdoor activities, and even damage properties. Studying the influence of the wind effects on the environmental quality is an important issue not only for the comfort of the dwellers but also for the pedestrian safety and the economic aspects of the location.
Several previous studies have explored and emphasized the importance of optimizing the urban design to mitigate adverse wind effects. These studies usually focused on the impact of the various building configurations and their effects on the pedestrian-level wind environments.
This paper spotlights the effects of building forms and heights on the wind behavior at the pedestrian levels. By proposing scenarios of a variety of deliberately suggested forms of building with ranged heights to examine and analyze, using the ANSYS Fluent software, the wind speed amplification and the wind speed-up areas around the buildings due to these scenarios, to achieve the best configurations that fulfill the urban comfort aspects.

Keywords: Wind comfort, pedestrian level, High-rise buildings, CFD simulation.

Sustainable Indoor Thermal Comfort Optimization in Public Buildings and its Impact on Occupants' Wellbeing

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Abstract. Urbanization, technological advancements and climate change have been the main driving factors for people to be more inclined to spend almost 90% of their time indoors. As a result, the effect of indoor environmental conditions on building occupants has increased significantly, more notably on geriatric people. This demographic is considered among the vulnerable communities as they become more susceptible to change in their surrounding environment, especially temperature as their activity levels and metabolic rate varies with time. Thermal comfort is a parameter of indoor environmental quality that is influenced by a range of factors including environmental conditions, individual differences, and lifestyles and in its absence, people may experience severe discomfort and sick building syndrome (SBS). As a result, this paper aims to develop design guidelines for the optimization of indoor thermal comfort in public buildings, geriatric homes specifically, using passive techniques that are adaptable in hot climate and are applied along different building life cycle stages. This will be achieved through the conduction of a thorough literature review to develop a comprehensive background about the topic and its key pillars. Secondly, a case study in hot climate will be analyzed and used as a reference to study the applicability of the proposed passive design guidelines in indoor thermal comfort optimization without compromising other indoor environmental quality factors. This study will conclude with a set of design recommendations for future projects.

Assessing the Impact of Air pollution on Masonry Walls of Muhammad Ali Palace in Cairo Using Spectrum Analysis

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Abstract. Built heritage has experienced significant degradation due to escalating air pollution, especially in urban centers, with high concentrations of pollutants. In Egypt, this environmental challenge has contributed to the degradation of valuable historical structures. Muhammed Ali Palace, situated in El-Manial district south of Cairo, exemplifies this issue due to its location in a traffic congested area, deterioration observed during field visits to the palace included surface recession, corrosion, and soiling. This study assesses the impact of air pollution on the masonry fence of the Muhammad Ali Palace using spectral analysis, a non-destructive technique for identifying the mineralogical alterations in the building material. A total of 158 points were tested at 14 locations on both the inner and outer sides of the fence. The study results indicates that the most severe alteration is on the outer side, where carbonates were replaced by sulfides, leading to gypsum formation. This alteration usually occurs due to the exposure to heavy traffic which forms a crust that accelerates erosion. Conversely, the inner side of the fence is protected by the presence of extensive vegetation. The research findings provide insights for stakeholders to develop effective conservation strategies to mitigate air pollution effects on heritage structures.

Policy Framework for Sustainable Aqua Sites Development in South Sinai

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Abstract. *The South Sinai region of Egypt, celebrated for its stunning landscapes and rich cultural heritage, has emerged as a key destination for wellness and heritage tourism. This study examines the region's distinctive geographical features, including its Red Sea coastline, mountainous terrain, and mineral-rich resources, which create an ideal environment for tourism development. Historical landmarks such as St. Catherine's Monastery and routes associated with Moses attract both spiritual pilgrims and adventure enthusiasts. The research is using an observation method to explore a policy of the interplay between wellness tourism and cultural heritage, highlighting the potential for sustainable development that supports local communities while preserving cultural and natural resources. Key attractions—Moses Path, Pharaoh's Path, the Sulphur Eyes, and Moses Wells—are analyzed for their roles in promoting socioeconomic engagement and enriching visitor experiences. By assessing economic impacts and conservation efforts, the paper aims to offer insights into integrated tourism strategies that enhance South Sinai's appeal as a premier travel destination while fostering environmental sustainability and community involvement. Additionally, a conceptual design and functional program for one of the four sites are proposed as a pilot project to inform developments at the other sites. The research employs an analytical approach, utilizing field visits and geological, environmental, and demographic studies to establish comprehensive development strategies based on tourism data from the western coast of South Sinai.*

Assessing Public vs. Professionals' Aesthetic Preferences of Public Art Initiatives in Informal Areas: *The Case of the Ring Road in Cairo, Egypt*

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Abstract. Informal areas exist worldwide, in which they are considered a global challenge, affecting cities image, as they are characterized by high populations, dense buildings, and poor infrastructure, among other aspects that turn them into low-quality-living, unsafe, ugly pockets in cities. The research argues that public art, as a powerful tool, can (re)image, represent, and revitalize informal areas and improve the quality of life for their residents. The research investigates public perception of art in Cairo's informal areas from different perspectives and how diverse groups perceive and value public art as a tool for enhancing informal areas that aims to inform urban planning, design, and public art initiatives. Through a mix of quantitative and qualitative research methods relying on the results of an achieved design competition, including interviews with competition jurors, user surveys, and competition jurors ratings, this study explores how different approaches influence the design and implementation of public art. The analysis of the collected data sheds light on the factors shaping public perception and the potential impact of public art on urban transformation. These include cultural resonance, aesthetic appeal, visibility, feasibility, and environmental integration.

Keywords: Public art, informal areas, Cairo, Egypt

Empowering Egyptian Neighbourhoods with the 15-Minute City Concept

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Abstract. Car dependency has become a significant challenge in Egypt, especially in big cities due to high vehicle density, lack of public transport, and inefficient traffic management. The 15-minute city is an urban planning concept that aims to create self-sufficient neighbourhoods with essential services such as shopping, healthcare and education are within a 15-minute walk or bike ride from home. Hence, this study adopted a comparative case study methodology to compare two cities that adopt this model in terms of urban design, infrastructure mobility, and implementation policy. The research aims to successfully implementing the concept in Egyptian neighbourhoods ensuring accessibility and walkability. The results of the research successfully developed guidelines to implement this planning strategy, focusing on 5 key phases: Assessment and Planning, Initiatives Phase, Identifying Areas of Need, Creating an Action Plan, and Monitor and Maintenance.

Keywords: Car dependency; 15-Minute City; Walkability

Heritage Sites in Digital Age: New Pathways to Sustain Cultural Identity

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Abstract. Heritage sites are essential as they represent the natural and cultural heritage of the world, promoting identity and contributing to education. To ensure that future generations connect with their past, heritage preservation is essential for safeguarding societies' historical identity and traditions. However, with the current digital age where technology has a prominent role in modern society, its integration into preservation efforts has become crucial. By bridging the gap between tradition and innovation, a harmonious balance can be achieved, allowing technological advancements to thrive while ensuring the preservation of rich cultural identities. This research aims to investigate preservation techniques, with a specific focus on technological preservation for heritage sites. To achieve this aim, research methodology consisting of qualitative and quantitative data of previously published literature, a conducted survey questionnaire and analysis of case studies was used to attain three objectives. Firstly, to establish a research foundation on the topic including the types of preservation strategies and the role of advanced technology in enhancing preservation of cultural heritage sites. Secondly, to validate the significance using technological preservation in heritage sites, through a survey questionnaire. Lastly, analyse two case studies of heritage sites that have implemented advanced technologies to safeguarding heritage sites. As a result, a framework was developed to guide the integration of technological tools into the preservation of cultural heritage sites in Egypt.

Keywords: Heritage Sites, Preservation, Digital Age, Future Generations.

Exploring the X-Minute City: A Chronological Analysis and Thematic Review of Proximity-Based Urbanism

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Abstract. The 15-Minute City (15mC) concept has emerged as a paradigm-shifting urban planning model aimed at enhancing sustainability, accessibility, and quality of life by ensuring that essential services and amenities are within a short walking or cycling distance. This study explores the historical roots of the X-minute City model through a chronological review of previous urban planning strategies and examines its practical implementation through a thematic analysis of five case studies representing different cities. The research identifies key challenges faced in these cities and categorizes them into five main themes: financial and resource constraints, governance and administrative barriers, public engagement and perception issues, socioeconomic dynamics, and infrastructure and urban development challenges. The findings reveal that while the X-minute City model has the potential to create more livable and sustainable urban environments, its implementation is constrained by institutional, financial, and societal challenges. The study highlights the importance of policy coordination, community engagement, and context-specific adaptation in overcoming these challenges. Future research should expand the analysis to additional cities to explore diverse urban contexts and further refine strategies for successful implementation. By bridging historical insights with contemporary case studies, this research contributes to the ongoing discourse on sustainable urban development and offers valuable insights for policymakers and urban planners.

Keywords: x-minute city, Chronological review, Proximity, Thematic review, Liveability

Scenario Planning in Spatial Planning Education: A Cross-Border Perspective

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Abstract. Scenario planning is increasingly recognized as a valuable tool in spatial planning education, particularly in addressing the complexities of cross-border integration. This study examines how exploratory scenario planning enhances learning experiences in a multidisciplinary urban planning studio, focusing on cross-border cooperation in European spatial planning. The research is based on a studio course at Aalto University, where students analyzed the Helsinki-Tallinn and Tornio-Haparanda regions. The findings suggest that scenario planning fosters critical thinking, interdisciplinary collaboration, and a nuanced understanding of governance, policy frameworks, and transnational planning challenges. However, the study also highlights the difficulties students faced in navigating legal, political, and cultural dimensions, alongside the linear nature of studio assignments. The results underscore the need for planning education to equip future professionals with adaptive, scenario-based methodologies to address European spatial integration challenges effectively.

Keywords: *Scenario Planning, Cross-Border Integration, Spatial Planning Education, European Spatial Development, Transnational Governance*

Crypto-Driven Solutions: Transforming Mobility through Blockchain for Smartness and Sustainability

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Abstract. This paper explores the integration of crypto-based blockchain interventions in evolving smart and sustainable mobility systems. The research mainly focuses on developing countries and limited resources settings. It investigates different challenges of transportation problems and negative environmental impact. The research highlights the impact of successful implementations of blockchain technologies to enhance operational efficiency for current transportation systems through systematic literature review and comparative case study analysis. It proposes a conceptual framework that synthesizes various insights from previous practices. Findings aim to provide applicable recommendations for decision makers to facilitate integrating blockchain technology with urban mobility in developing countries, with special emphasis on the potential of crypto-enabled solutions greener urban future. Insights in the presented work target decision-makers like urban planners, technologists and policy makers, presenting a structured guide for innovative crypto-solutions to enhance urban mobility systems.

Keywords: Blockchain technology; Smart mobility; Smart sustainable solutions.; Smart cities

II- Civil Engineering.

A Comparative Study on Blast Resistance of Traditional/Developed Lightweight Protective Layers

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Abstract. This study introduces and numerically evaluates an improved lightweight reinforced concrete (RC) sandwich panel designed for enhanced blast resistance. The proposed panel features a unique core configuration comprising double helical springs and a steel plate, offering superior energy absorption compared to traditional sand-core sandwich panels. Using finite element modelling (ANSYS AUTODYN), the dynamic response of the RHSHR panel under free air blast loads is analyzed and compared with traditional designs, focusing on deformation behavior, failure modes, and overpressure mitigation. Results demonstrate that the RHSHR panel significantly reduces blast-induced overpressure transmission by approximately 89% while maintaining structural integrity, highlighting its potential for protective applications where lightweight and blast-resistant materials are critical, such as military and civil defense structures. The findings provide valuable insights for advancing blast-resistant construction technologies.

keywords: Lightweight protective sandwich panels; Free air blast loads; Helical springs.

Transforming Defective Collapsed Concrete into Recycled Aggregate for Sustainable Concrete Production: A Case-Study on Coastal Land Reclamation Using Eco-Units and Geotube Technology

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Abstract
Some areas face difficulties like wars, earthquakes, or infrastructure changes, causing concrete waste. Those areas need innovative ideas to turn this waste from an obstacle waste into a useful material for construction and growth. This study aims to produce sustainable concrete from concrete waste. An experimental program was done by replacing natural aggregate with recycled concrete in percentage of 10%, 20%, 30%, 40%, and 50% of the total natural aggregate by weight. The mechanical properties were studied by compressive, flexural and splitting tensile strength tests, and the durability was studied by density test and absorption test. A theoretical case-study was also prepared on the use of recycled concrete to produce concrete units to be used in offshore protection and land reclamation using Eco-Units and Geo-Tube. The experimental program results showed a decrease in the mechanical properties of sustainable concrete using recycled concrete aggregate especially for the ratio of 50% replacement. The results proved that the resulting sustainable concrete has acceptable properties, especially for non-structural uses such as off-shore protection and coastal land reclamation, slightly weaker than natural aggregate concrete. more than one benefit such as natural resource conservation, and coastal land reclamation are important reasons for using recycled concrete aggregate, especially when found in disaster areas.

Key words; Recycled concrete, Recycled aggregate; Land reclamation, Geo-tube, Eco-Units

Experimental Investigation of R.C Beams Using New External Strengthening System Under Torsion Load

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Abstract. There are many problems in some concrete structures due to increased load or age of the structure, etc., this led to the search for solutions to avoid these problems. One of these problems is the twisting of the beams implemented in the structure, and on it appeared what is called Strengthening, which is what we will discuss in this research, which is improving the performance of concrete beams to limit the effect of twisting by using different systems. All of these systems are used after casting the beams, i.e. during the construction of the structure. In this research, five reinforced concrete beams were tested, the first is a control beam and the other four are strengthened by the near-surface mounted (NSM) method by using steel bars formed in the shape of the letter U. The difference between the beams was made in changing the distance between the pin beams [S] and the length of the overlap between the branches of these beams [Lo], and finally [a hook] of 50 mm length was made in the branches of the beams and fixed inside the beam section. The results showed the effective effect of these systems in terms of the beams' tolerance to the torsional moment, torsional angle, crack patterns and ductility coefficient of the Strengthen beams compared to the control beam.

Keywords:
Torsion; Strengthening; RC Beams; Steel bars.

A study to investigate the compressive strength and flow of alkali activated slag mortar using two curing regimes

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Abstract. This research investigates the potential for producing more environmentally friendly mortars by replacing cement with Ground Granulated Blast Furnace Slag (GGBS). The study examines the influence of key factors on the properties of GGBS-based mortar activated using sodium silicate (SS) and sodium hydroxide (NaOH). Specifically, it explores: (1) the effect of different SS types—base and neutral type; (2) the sodium oxide (Na_2O) content, derived from both activators, with concentrations of 12% and 15%; (3) the impact of curing methods, including ambient temperature curing and full water immersion (submerged); and (4) the role of the water-to-binder (w/b) ratio, assessed at 43% and 48%. The performance of GGBS mortars was evaluated in terms of compressive strength and flowability. The results showed no significant difference between the two SS types; however, the base SS was recommended due to its lower NaOH content to reach the same Na_2O content, which leads to reduced generated heat when preparing the solution. Additionally, a 12% Na_2O concentration yielded higher compressive strength and enhanced flowability. While increasing the w/b ratio improved flowability, it had a detrimental effect on compressive strength. Furthermore, submerged curing significantly reduced compressive strength compared to ambient curing.

Keywords: GGBS, Alkali Activation, Curing Regime, Na_2O Percentage, Compressive Strength.

Impact of Projectile Weight and Apex Angle on Penetration Depth in Sandy Soils

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Abstract. This study investigates the influence of projectile weight and apex angle on penetration resistance in sand. Controlled experiments were conducted using conical-nosed projectiles with apex angles of 10°, 30°, 60°, and 90°, and weights ranging from 2.445 kg to 6.81 kg. The penetration depth was measured for each configuration to evaluate the individual and combined effects of these parameters. The results revealed that both projectile weight and apex angle significantly affect penetration depth. Increased projectile weight resulted in deeper penetration due to the greater kinetic energy upon impact. Apex angle also played a critical role: where projectiles with sharp apex angles ranging between (10° and 30°) concentrated the impact force, resulting in deeper penetration, whereas those with blunt angles, i.e. (60° and 90°) dissipated energy over a larger area, reducing penetration depth. These findings have practical implications for designing protective systems and buried infrastructure in high-density soils. By isolating the effects of weight and apex angle, this study provides foundational insights that can be applied to optimize penetration resistance strategies for military and civil engineering applications.

Assessing the Influence of EAFS on Alkali Activated Mortar: Mechanical Properties, Chloride Penetration, and Elevated Temperatures

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Abstract. With the increasing focus on sustainable practices and environmentally friendly solutions, the construction industry has made significant progress utilizing electric arc furnace slag (EAFS) in construction materials. This shift has been primarily driven by the need to reduce the negative impacts of traditional cement production on the environment, as well as the high costs associated with conventional construction materials. Through the innovative use of EAFS as both a binder and fine aggregate, alkali-activated mortar (AAM) has emerged as a promising alternative to traditional cement mortar. In this study, various tests were conducted to examine the performance of AAM, including compressive strength, rapid chloride penetration, and resistance to elevated temperatures. The results of the study showcased the remarkable strength and durability of AAM, making it a clear standout in comparison to traditional cement mortars. With a compressive strength of 35.8 MPa and a moderate level of chloride penetration, AAM proves to be a highly effective solution in construction projects. Additionally, the fact that it only experiences a minimal 11% strength loss when exposed to extreme temperatures of 800 degrees Celsius for 2 hours is a testament to its resilience and potential for use in high-temperature environments.

Keywords: Alkali activated mortar, Electric Arc Furnace Slag, Slag fine Aggregate, RCPT of Electric Arc Furnace Binder

Design and Implementation of Ultra-High Performance Fiber-Reinforced Concrete Mixtures

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Abstract. Advanced cementitious and fibrous technologies are used for manufacturing ultra-high-performance concrete (UHPC), which has remarkable strength and endurance. Its dense microstructure minimizes porosity, effectively preventing the penetration of ingressive materials. The maximum compressive and tensile strength was achieved by Mix 7, which contained 30% SF and 15% FA, proving the value of a balanced SCM ratio. On the other hand, because of the delayed pozzolanic reaction, an excessive amount of FA, as observed in Mixes 3 and 6 (52% FA), had a negative impact on early-age strength. Similarly, mix 10's compressive strength decreased when the SF content was increased to 52%, highlighting the significance of preserving an ideal SCM balance. Furthermore, the lowest strength values were observed by Mixes 9, 11, and 12, whose cement concentration was less than 300 kg/m³. This confirms that UHPC requires a minimum cement threshold.

Keywords: High-performance concrete, Fly Ash, Silica Fume, Pozzolanic materials.

Experimental study on partial replacement of fine aggregate by surkhi

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Abstract: Recently, industrial waste has grown drastically, causing several countries to investigate its usage. Recycling industrial waste in concrete is an efficient way to achieve sustainability while decreasing the environmental impact. This strategy not only improves the characteristics of concrete but also reduces building expenses. The current study focuses on using powdered burnt clay (surkhi), air-cooled blast-furnace slag (ACBFS), and ground granulated blast-furnace slag (GGBFS) as partial replacements for fine and coarse aggregates, as well as ordinary Portland cement. The research examines M40 grade concrete with a water-to-cement ratio of 0.36, utilizing three different percentages of cement and coarse aggregate replacements with GGBFS and ACBFS: 20%, 30%, and 40%. Additionally, fine aggregate is replaced with surkhi in three percentages: 10%, 20%, and 30%. Compressive and splitting tensile strength tests are conducted on different curing days for all mixes. The strength of the cube specimens ranges from 51.87 N/mm² to 69.71 N/mm². The optimum compressive strength of the concrete mix is observed to be 69.71 N/mm², achieved with 20% GGBFS and 10% silica fume, and the sample containing 20% ACBFS and 10% silica fume has the maximum splitting tensile strength.

Keyword:
Sustainability, air–cooled blast–furnace slag (ACBFS), Ground granulate blast-furnace slag (GGBFS), surkhi, Compressive strength, Industrial waste materials.

Experimental Investigation of High Strength Geopolymer Concrete under Fire Resistance

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Abstract. Geopolymer concrete is an innovative material that is gaining popularity due to its superior performance and environmental sustainability. The objectives at the current work are to study the effect of slag content, the concentration of alkaline activators on the thermal resistance of geopolymer concrete (GPC). Three mixes of GPC were casted and tested. These mixes are devided into two groups, the first one consists of three mixes: each three slag contents were used 400 kg/m³, tested; for each slag content three different activators percentages were tested; 8%, 10% and 12%. The second group consists of one mix: three different metakaolin replacement ratios were investigated 10%, 15% and 20% for each replacement ratio, two alkaline activators ratios were tested: 10% and 12% while the slag content kept constant for all group mixes at 400 kg /m³. For comparison purposes, a control mix of OPC was casted and tested with cement content of 400 kg/m³. The whole mixes were exposed to six different temperature 200°C, 300°C, 400°C, 600°C and 800°C for two hours duration. Compressive strength test were carried out after the heat exposure at 28 days age. The results indicated that within the limits of slag content and activator percentages used, the fire resistance increases as the slag content and activator percentages increases. The addition of metakaolin considerable improves the fire resistance of GPC up to 15% replacement ratio. Geopolymer concrete showed superior fire resistance compared to ordinary portland cement (OPC).

Keywords: Geopolymer, Composites, Fire Resistance, Efficiency, Thermal Resistance.

Prediction of Progressive Collapse for Multi-Storey Steel Moment Frames Using Machine Learning Algorithms

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Abstract. The growing importance of artificial intelligence (AI) in structural engineering has highlighted the effectiveness of machine learning (ML) techniques for data prediction. This study focuses on progressive collapse, a critical phenomenon where the failure of a single element can lead to the collapse of an entire structure, particularly in multi-storey steel frames, one of the most common structural systems. The primary factor in preventing progressive collapse is the accurate prediction of the load increase factor (LIF), a crucial parameter for assessing structural susceptibility. Traditional finite element (FE) analysis for progressive collapse is complex, time-consuming, and prone to human error. To address these limitations, this study proposes a novel approach combining ML with FE simulations to predict LIF. We generated a dataset of 3990 models using commercial FE software, and used them to evaluate various ML algorithms, including linear/polynomial regression, decision tree, and random forest. The results demonstrate the potential of ML as a powerful tool for improving the accuracy and efficiency of progressive collapse analysis in structural engineering.

Keywords: Artificial Intelligence (AI), Progressive Collapse, Load Increase Factor (LIF), Finite Element Modeling (FEM), Machine Learning (ML), Structural Steel Frames, Predictive Analysis, Damage Prediction

A Novel Approach for Digital Building Modeling Using LiDAR and Image Data Integration

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Abstract. Accurate and realistic 3D building reconstruction remains a fundamental challenge in the fields of photogrammetry and remote sensing. This study introduces an integrated methodology that enhances building model generation by fusing airborne LiDAR and photogrammetric data, capitalizing on the complementary strengths of both sources. The proposed approach involves feature extraction, segmentation, and 3D model reconstruction based on the identification of planar surfaces and boundary primitives within the fused point cloud. Data were acquired over the Tora Cement Factory in Cairo, Egypt, using DJI Zenmuse L1 (LiDAR) and P1 (RGB) sensors. To ensure precise georeferencing and validation, twelve ground control points (GCPs) were measured using the Trimble R10 GNSS system. The final 3D building model derived from the fused dataset achieved a root mean square error (RMSE) of 7.4 cm, significantly outperforming models generated from LiDAR-only data (11.2 cm) and photogrammetric-only data (14.6 cm). These findings demonstrate the effectiveness of the proposed fusion strategy in improving geometric accuracy and structural completeness, offering a robust solution for high-quality 3D building reconstruction from multi-source aerial data.

Seismic Response of Multi-Storied Steel Building with Various Configurations Resisting Systems in Seismic Zone V in Egypt

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Abstract. In recent years, structural engineers have focused on the dynamic behavior of lateral loads, particularly seismic loads, in multi-story buildings. Analyzing the consequences of earthquakes is essential to prevent structural collapse and damage. Resisting frames, shear walls, bracing, cores, tubular, and outrigger systems are among the best structural resisting systems to increase stiffness and decrease building seismic forces. This study investigates the effects of various configuration-resisting systems on the seismic forces of a 25-story residential steel building in seismic zone V in Egypt under the ECP201-2012 code requirements. The ETABS software is used to analyze seven proposal models using the finite element method in seismic zone V, with soil condition class A (rock soil). The results indicate that when compared to other structural models, it's found that Model 6 shows better results in story drift with a decrease to 16% and in maximum story displacement with a decrease to 20% of the results from the traditional building, the steel building with the viscous damping technique (VDT) shows better results in story drift with a decrease to 57.5% and 61.5% in the x and y directions and maximum story displacement with a decrease to 44% of the results from the traditional building, and by comparing (Model 6) and the system with VDT it's found that Model 6 shows better results in story drift with a decrease to 26.5% and 28.5% in x and y directions and in maximum story displacement with a decrease to 46.5% of the results from the model with VDT; therefore, Model 6 is considered the best configuration-resisting system to use in construction according to this case study.

Keywords: Response Spectrum Analysis, Seismic Zone, Shear Wall, Bracing System.

Auxetic Metamaterials for Seismic Wave Mitigation: A State-of-the-Art Review of Recent Literature

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Abstract. Auxetic metamaterials with negative Poisson's ratio (NPR) have gained attention for their potential in low-frequency seismic wave attenuation and earthquake-resistant construction. This review explores recent advancements in auxetic metamaterials for seismic engineering, focusing on their wave suppression mechanisms, structural reinforcement, and energy dissipation capabilities. Numerical simulations and experimental studies demonstrate significant improvements in bandgap widths, vibration damping, and seismic acceleration reduction when using NPR-based metamaterials. These materials have been successfully integrated into base isolators, shear walls, and bracing systems, showing superior mechanical performance compared to conventional materials. However, challenges remain in terms of large-scale implementation, economic feasibility, and long-term behavior under repeated seismic loading. This review highlights key advancements, current limitations, and future research directions, emphasizing the potential of auxetic metamaterials in next-generation earthquake-resistant infrastructure.

The Role of Non-Structural Elements in Progressive Collapse Resistance: A Review of Partitions and Facades Under Extreme Loading Conditions

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Abstract. Progressive collapse occurs when the failure of a critical load-bearing component triggers a chain reaction, potentially leading to the total or partial collapse of a structure. This issue is particularly critical in reinforced concrete (RC) buildings, where limited redundancy and ineffective load redistribution accelerate failure. While research has extensively examined structural elements in collapse prevention, the role of non-structural elements—such as partitions and facades—remains insufficiently studied. Although not designed for load-bearing, these elements influence overall stability under extreme conditions. Studies show that non-structural elements respond differently to seismic, blast, and accidental loads, affecting structural integrity. Drywall partitions, though flexible and easy to install, are vulnerable to detachment and secondary failures. Masonry partitions enhance load redistribution and structural strength, proving more effective in seismic resistance. Similarly, double-skin facades (DSFs) reduce inter-story drift and improve energy efficiency, yet their behavior in progressive collapse scenarios remains underexplored. This review compiles insights from numerical modeling, experimental studies, and real-case failures to assess the role of non-structural elements in collapse resistance. It highlights research gaps and the need for full-scale testing, enhanced connection detailing, and 3D numerical modeling to integrate non-structural components into progressive collapse mitigation strategies.

Keywords : Non-structural elements , Progressive collapse, collapse resistance, Drywall Partitions, Masonry, Double Glazed Facade

Modeling Road Safety for signalized crossings in urban Roads Case Study: Corniche Road - Alexandria, Egypt

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Abstract. Recently, Egypt has invested heavily in expanding the road network, highlighting the need for improving highway safety. Ensuring safe intersection design has become a priority due to the critical impact of intersection-related crashes on traffic safety. This study focuses on the signalized intersections along Alexandria Corniche Road, aiming to develop a safety performance function (SPF). Negative Binomial (NB) regression was used since the Likelihood Ratio (LR) test confirmed its superiority over the Poisson model. Crash data from 2019 to 2022 were analyzed to investigate the relationship between intersection characteristics and crash history. Main traits, including intersection length (X_l), Average Daily Traffic (ADT), and Average Daily Pedestrian Volume (ADPV), were identified as significant contributors to total crashes. The Variance Inflation Factor (VIF) ruled out multicollinearity. Additional variables like pedestrian crossing time percentage (TG%) and number of lanes (N_{lanes}), were excluded to avoid overfitting, enhancing the crash prediction accuracy of the model.

A Review of Research and Performance Assessment on the Sustainable Application of Industrial Slag in Reinforced Ferrocement Slabs

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Abstract. Ferrocement, patented in 1856, is recognized for its efficiency and sustainability in structural applications. This paper reviews studies on reinforced ferrocement slabs, focusing on industrial slag incorporation as an eco-friendly alternative material. The review evaluates mechanical properties, structural behavior, and environmental benefits compared to conventional concrete. Industrial slag, by-products of manufacturing processes, show significant potential in enhancing ferrocement performance while reducing environmental impact. Optimal replacement levels were identified as 50% for ground granulated blast-furnace slag (GGBS) and 15% for metakaolin, beyond which performance may decline. The study highlights nanoscale materials (nano-silica and nano-fly ash) for microstructural improvement, with nano-fly ash performing effectively at replacement levels up to 10%. This review provides insights into using industrial slag and nano-byproducts to develop sustainable, high-performance ferrocement slabs, advancing eco-efficient construction practices.

Keywords: Ferrocement slabs; Slag; Impact; Wire mesh; Polypropylene fibbers; Nano materials; Fly ash; Met kaolin.

Comparative Study of Full-Depth Reclamation Pavement Performance Using Different Cement Types

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Abstract. This study evaluates the performance of Full-Depth Reclamation (FDR) with cement stabilization using seven Egyptian cement types. Unconfined Compressive Strength (UCS) tests were conducted on samples with cement ratios ranging from 0.5% to 5.5% following ASTM D1633-2017. Results indicate that Al-Sahm Beni Suef cement (CEM I 42.5N) achieved 250 psi and 300 psi UCS at 1.5% and 2.2% cement ratios. The optimal cement ratio for 250 psi UCS varied between 1.20% (Al-Sahm Beni Suef cement) and 2.58% (Suez Sulfate-Resistant Cement) and the optimal cement ratio for 300 psi UCS varied between 2.20% (Al-Sahm Beni Suef cement) and 3.47% (Suez Sulfate-Resistant Cement). These findings provide actionable insights for selecting cost-effective and durable cement types for FDR projects in Egypt.

Review of Pavement Performance Indicators: Measurements, Applications, and Limitations.

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Abstract. Assessment of pavement performance is required for efficient pavement management, maintenance, and rehabilitation planning. Governments and agencies use pavement performance indicators (PPIs) to track deterioration, optimize maintenance, and provide road safety. The indicators are classified according to expression, complexity, and purpose of evaluation, such as structural, functional, and safety indicators. As the pavement structure worsens, the rate of deterioration in functional and safety conditions increases. Accordingly, in this paper, structural indicators are accorded due emphasis, which are direct measures of pavement condition. Structural Condition Index (SCI) is one widely applied index to quantify pavement strength. Structural measurement techniques such as the Falling Weight Deflectometer (FWD) and Traffic Speed Deflectometer (TSD) aid in structural assessment. The Structural Strength Index (SSI) also aids in optimizing decision-making by providing a numerical value of load-carrying capacity. Future developments focus on machine learning, predictive modeling, and GIS software for more advanced pavement assessment.

Keywords—Pavement performance, Structural Condition, FWD, SCI, and SSI.

Relationship between Uphill Runway Slope, Acceleration and Takeoff Distance of Fixed - Wing Aircrafts

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Abstract. The present research paper investigated the factors that affect takeoff distance for fixed wing aircrafts. One of the important factors that were studied and analyzed in detail is the runway longitudinal inclination or slope and its impact on determining takeoff distance and takeoff performance for fixed wing aircrafts. To evaluate the potential impact of runways longitudinal slopes on determining the safe and required takeoff distance, the internationally recognized standard limits for these slopes were reviewed. As part of this study, a case study was examined involving an Airbus A380- 800 that tookoff safely from Sydney Airport. The actual takeoff distance was measured on sits and compared with the theoretically calculated takeoff distance, allowing for an evaluation of the accuracy of the applied taking in consideration the runway longitudinal inclination or slope and all other conditions.

Keywords: Takeoff Distance; Ground Run Distance; Performance Chart; Maximum Takeoff Weight; Pressure Altitude; Stall Speed; Takeoff Speed; and Takeoff Performance.

Optimizing Railway Network Capacity: Analytical Approaches and Case Study Insights

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Abstract. Railway capacity optimization is essential for efficient and sustainable transportation. Optimization strategies help maximize the use of existing infrastructure, reducing the need for costly expansions and minimizing environmental impact. By enhancing train scheduling, signaling systems, and operational policies, rail networks can accommodate more traffic with fewer delays, improving overall service reliability. This paper examines key factors influencing railway capacity, including headway time, block section length, signaling systems, and operational speeds. Various analytical models and methodologies for capacity estimation are discussed. This paper uses the UIC's approach because it provides a clear and practical method for improving the performance of rail networks. The UIC's focus on international standards and cooperation helped to build a strong foundation for understanding capacity problems and suggesting effective solutions. It is utilized Along with a case study on the Egyptian National Railways (ENR) network. The results show that railway capacity is significantly influenced by signaling systems, train speed, block length, and braking performance. Optimizing these factors—by reducing headway, improving speed within policy limits, shortening block lengths, and enhancing braking systems—can lead to substantial increases in overall line capacity.

Keywords. Railway capacity, headway time performance, UIC Code 406, capacity assessment

III- Project Management.

Applying a revised six-stage value engineering job plan in Egyptian banking sector construction projects to optimize cost efficiency and improve value

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Abstract. Traditional VE frameworks often fail to address specific challenges unique to banking facilities, such as stringent security requirements, regulatory compliance, and advanced technological demands. This study explores the application of a revised six-stage value engineering (VE) job plan tailored for construction projects in the banking sector. The revised plan integrates critical factors, including enhanced security measures, economic feasibility, sustainability, safety standards, and long-term maintenance needs. A case study of a new branch for the Egyptian Export Development Bank construction demonstrates the effectiveness of this approach, highlighting innovations like reinforced security systems, sustainable energy solutions, and advanced compliance protocols. The findings illustrate how aligning VE methodologies with banking sector standards can optimize cost efficiency, enhance functionality, and foster sustainable development, offering a robust framework adaptable to similar high-security, technology-driven environments.

Keywords: Value Engineering, Construction Projects, Cost Efficiency, Sustainability, Value Index.

Smart Contracts towards Reducing Disputes in Construction Projects in Egypt

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Abstract. The construction industry is among the few industries that contribute to the growth and development of the economy; its size gives a representative potential in contributing to economic development. However, the nature of the construction industry in Egypt is plagued by disputes, which often arise from contractual issues, communication breakdowns, and project management challenges during various stages of the project. Furthermore, construction contracts are always viewed as complex and dense paperwork that makes it difficult to extract necessary information, inhibiting smooth operation. This can be solved by implementing smart contracts. A smart contract can include blockchain technology that executes agreed-upon terms automatically and autonomously. This data-driven mechanism automatically issues payments at the end of each clause, reducing the potential for disputes. The aim of this research is to Investigate the potential of smart contracts in reducing disputes in the construction projects. This study will be performed by adopting a qualitative approach through collecting and analysing data from various literature sources, as books, journals, and existing research, to construct a comprehensive understanding from a holistic point of view focusing on relevant keywords as smart contracts and disputes during various stages in construction projects to identify the relationship between them and present it in a relationship matrix. Second, analysis of case studies to investigate the effectiveness of smart contracts and validate the identified relationship and view its potential in construction projects.

Keywords: Smart contracts; Disputes; construction projects; Egypt.

Change Management Towards Enhancing Competitive Advantage Through Embracing Technological Innovation in Architectural Design Process: An Investigative Study

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Abstract. Companies are subjected to great losses and vast competition due to changes that happen every day in the architecture and construction industry. Changes may occur in customer needs, competitor movements, financial crisis, development in the global economy, and technological innovation. As a result, companies will drastically fail in competition with other firms and projects will be delayed. However, this could be controlled by utilising practices and strategies of Change Management (CM) in the firm. By using change management strategies, firms should provide approaches to articulate and execute changes in their internal and external processes. Additionally, change management allows firms to control results by setting clear goals, balancing several change aspects, and allowing employees to adapt to change faster and be more productive. Since the industry is subjected to technological innovation, this research aims to investigate Change Management as a tool for adapting to technological innovation used in the design process for an enhanced competitive advantage. To attain this, a qualitative method was used through investigating previous literature to identify the tools used in the design process, competitive advantage, and change management strategies. Furthermore, a case study is analysed to explore how effective can change management be in adapting to technological innovation and enhancing competitive advantage.

Keywords: Change Management Framework; Competitive Advantage; Architectural Design Process.

Cloud-Based Computing System for Improving Collaboration During the Design Process: An Investigative Study

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Abstract. Architecture design process require efficient collaboration between multiple teams, as the information exchange is vital throughout the workflow. Thus, failure of collaboration between the different members of the project might result in poor planning, delays, and variations in project costs. However, the introduction of different methods was sought to cutdown on the final costs, reduce timeline, and improve quality by enhancing collaboration. This research will focus on one method that is Cloud-based computing systems (CBCS). Therefore, the aim of this research is to investigate the capability of CBCS in improving the collaboration between stakeholders. This will be achieved through 3 objectives. First, a literature review is used to investigate the nature of the design process and its challenges, outline the causes of poor collaboration, and finally present types of CBCS and their benefits towards collaboration. Second, relationship between CBCS and collaboration is deducted and outlined based on literature findings. Third, A case study is analysed showing how the implementation of CBCS into design process improves collaboration validating the deduced relationship. The goal of this research is to establish a base for a new paradigm where CBCS could enhance collaboration during the design process.

Keywords: Collaboration; Architecture Design Process; Cloud-Based Computing System.

Promoting Tourism through Sustainable Adaptive Reuse of Heritage Buildings in Developing Countries

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Abstract. One of the most prevalent and fastest-growing segments of the tourism business today is the heritage tourism, especially in developing nations. However, many heritage buildings are neglected and demolished due to environmental and urbanization factors. As a result, the tourism rate deteriorates which in turn affects economic prosperity. This deterioration could be controlled by implementing sustainable adaptive reuse strategies for heritage buildings. These strategies are based on innovative design techniques, developing policies, community involvement and aligning the maintenance goals with the building's purpose to increase its heritage value. This research aims to investigate sustainable adaptive reuse principles and strategies and their relationship with minimising challenges encountered by heritage tourism in developing countries. To attain this, a qualitative approach is used. Firstly, literature is reviewed to investigate concepts on which this study is built upon. These are tourism, heritage buildings, developing countries and sustainable adaptive reuse, its principles & design strategies. Adding to this, a relationship matrix is proposed between the studied concepts based on the previous literature to serve as a tool for architects to identify the suitable strategies for their projects. Finally, a case study is analysed to investigate the effectiveness of the adoption of these strategies in minimising the challenges of heritage tourism in developing countries. When comparing the research's literature outcome with the case study analysis, the results corresponded. Hence this presents an initial validation for the proposed matrix, initiating the first step for further research to develop.

Keywords: Developing Countries; Sustainability; Adaptive Reuse; Tourism; Heritage Buildings.

BIM integration for cost management included inflation and market volatility

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Abstract. Cost overruns in construction projects are often driven by inflation and volatile material prices, which are inadequately captured by traditional estimation methods. This study introduces a dynamic, BIM-integrated automated cost estimation framework that incorporates real-time material pricing and official economic indicators to enhance financial planning and mitigate risk. A case study involving 316 residential buildings in Egypt revealed a 24.65% cost overrun, primarily due to significant increases in material prices, particularly for steel and cement. By continuously updating cost data and aligning it with national inflation indices, the proposed framework enhances estimation accuracy, supports proactive decision-making, and enables adaptive budget control throughout the project lifecycle. The findings emphasize the value of integrating real-time economic data into digital construction workflows.

Keywords. Automated Cost Estimation, Inflation Impact on Construction, Dynamic Pricing, and Real-time Cost Tracking.

Analysis and prediction of Canadian construction industry demand

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Abstract. The construction sector's volatile demand is often cited by contractors as a barrier to maintaining consistent staffing and workload. To evaluate this claim, this study analyzed Canadian building permit data, a proxy for industry demand, using statistical and machine learning methods. The analysis aimed to determine the predictability of demand despite economic and political influences. Statistical analysis revealed demand stability with minimal variability and consistent yearly patterns, highlighting a dominant seasonal effect over a subdued trend. Predictive models, while exhibiting occasional higher error rates (up to 30%), generally demonstrated that historical patterns can be replicated for future demand forecasting with errors around 7%. These findings challenge the contractors' assertion of unpredictable market fluctuations that impede workforce stability, suggesting that workload fluctuations may stem from other factors requiring further investigation.

Keywords: time series analysis, construction industry demand prediction, market fluctuation modeling

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As we conclude this year's conference, we extend our sincere gratitude to all researchers, speakers, attendees, and partners who made this gathering possible. Your contributions, energy, and insights are what drive innovation and progress in our field. We hope the conversations sparked here will grow into lasting collaborations.

See you next year