Professional Diploma

FAÇADE ENGINEERING

Presented By

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Exclusive preparing scientific material and Prime Lecturer

INTRODUCTION

"Façade Engineering is the Art of resolving Aesthetic, Environmental and Structural issues to achieve the enclosure of habitable space".

Society of Façade Engineering

A building's skin can define its value, performance and architectural expression.

Why façade engineering?

Façades and building envelopes – which form the outer skins of buildings – project image and creative intent. Increasingly, they are also understood as important environmental moderators and key influencers in project risk and commercial success.

A thoughtfully designed skin can make a new building work more effectively for its owners, occupants and environment. It can also transform the performance of an existing building.

Façade cladding systems have very large impacts on all aspects of any building performance. They directly influence peak heating and cooling loads, and indirectly influence lighting loads when day-lighting is considered.

Because they are prominent architectural and design elements and because they influence occupant preference, satisfaction and comfort, the design optimization challenge is more complex than with many other building systems.

Why this diploma?

As the interface between interior space and exterior environment, a building's skin plays a crucial role in heat and light exchange. Its performance in that role affects occupant comfort and productivity, energy use and running costs.

This facade engineering diploma covers material science, building physics, building performance as well as different cladding systems which helps to deliver optimal performance in façades.

This diploma provides an integral combination of the theoretical and practical knowledge basis for a complete and sound understanding of all disciplines attributing to the operational performance of façades.

It examines the complex inter-relationships between those different aspects.

Knowledge of materials, methods of manufacturing and installation are an essential element in the successful design of façades, and are given a conspicuous place in the diploma which will be expanded though varies factories and site visits.

The diploma is certified by **NEVADA University** at the United States, certificate could be released against certain fees to be paid to the university. The University has been ranked in the top 150 universities in the world by the Academic Ranking of World Universities (ARWU), published by Shanghai Jiaotong University.

The University is ranked in the 101 to 150 group overall and in the 10 to 14 group in the USA – alongside LSE, Sheffield, and Sussex – which is a similar position to previous years.

Talent
OUTSOURCING

LICENCE AGREEMENT

April 11, 2015

NEVADA UNIVERSITY

Preliminary Agreement

Given for its Talent Outsourcing of services within and outside the US and its ongoing quest to develop education and maintain quality instruction in developing countries.

In the framework of community development has been held that the protocol between the Talent Outsourcing and the Nevada Univ. Accordingly, the University gives all the powers of the NU and its terms as follows :

1 - Registration and assist students in (Department of Distance Education) to train and supervise students, and research and to facilitate the procedures provided to them

2 - Registration and assist students who wish to travel to University and study measures to facilitate them.

3 - Registration, control and supervise the executive Organizations and institutions in any state requirement for a headquarters of the Talent Outsourcing

4 - Distribution of scholarships from the University by the International Plan of Development of the Talent Outsourcing

5 - using the name of the University and the logo as one of its own supporters

6 - commitment to the goals agreed to by the standard of education and training international

GRANTEE	GRANTOR
Talent Outsourcing Egypt	**Nevada University**
Dr. Ahmed Samir	Dr M.Robert
President of the (Talent Outsourcing)	President of the (NU)

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Talent outsourcing
PROFESSIONAL SERVICES PROTOCOL

Agreement Date: 20th of November, 2015.

This Agreement entered into by and between Talent outsourcing, with office address at Al Maadi Star Towers (4A), Cornish El Nile, Cairo Egypt. Represented by its Head of Management, D. Ahmed Samir here in after referred to as Talent, (First Party)

And

Soic Infinity Solutions International S.A.E For Contracting with office addresses at 6 Sally Mall Towers, Abd Elhameed Lofty Street, Behind of Serag Mall, Nasr City, and Cairo Egypt. Represented here in by its Chairwoman, Eng. Shaimaa Oleba, here in after referred to as Client (Second Party)

Set forth the following purposes, terms and stipulations:-

1. GENERAL PROVISIONS:

1.1 **Talent agrees to perform ROFESSIONAL SERVICES PROTOCOL services as specifically requested by Client and as generally described in "The Job Description" for the position for which Talent's services are engaged.**

1.2 **The Client shall utilize talent's personnel, technical know-how, facilities and services for processing the search & selection of employees to be hired through the said.**

1.3 **Talent shall make available to the Client, pre-screened applicants as requisitioned. As may be agreed upon by both parties, the Client shall have the final authority on the selection of personnel for employment and that the selection shall satisfy the requirements of the Client for all intents and purposes.**

1.4 **The services of Talent shall include, but not limited to:** Client's needs assessment, searching for candidates and obtaining their CVs, filtering & screening of employment applications, pre-selection interviews & tests (as applicable), documentation, and records keeping.

OBJECTIVES

Main Objective:

The main objective of the diploma is to provide graduates with a broad understanding and knowledge of facade engineering. This is to ensure that they will have the skill, knowledge and understanding to design, manufacture and construct building facades and cladding. The diploma is intended to broaden graduates from their original disciplines to have an understanding of all aspects of the building envelope.

OBJECTIVES

Secondary Objectives:

Innovations and emerging issues

To develop and bring to market, innovative façade technologies, more efficient glazing, shading systems, day-lighting systems, and integrated controls with significant potential for increased energy efficiency in buildings beyond applicable standards.

To study wide variety of innovative façade technologies on the market or emerging into the market that could deliver potentially significant energy savings.

OBJECTIVES

Secondary Objectives:

Structural engineering and integrity

- To provide a sound structural engineering knowledge relevant to façade engineering.
- To develop an understanding of how to enclose and seal buildings.
- To introduce concepts of performance specification.

OBJECTIVES

Secondary Objectives:

Building physics

- To give a holistic view of the design of buildings.
- To develop an understanding of comfort in buildings.
- To provide a knowledge of the energy efficiency in buildings Materials and design.
- To develop concepts of durability and life cycle costs.
- To give knowledge of facade construction and manufacture and of façade materials.

OBJECTIVES

Secondary Objectives:

Management

- To specify the role of the different participants in the envelope design and construction.
- To develop concepts of quality within the design and supply process.
- To provide knowledge of the industry structure and culture.

OBJECTIVES

Secondary Objectives:

Research methods

- To give an understanding of information sources.
- To develop an understanding of critical review.
- To develop an ability to write scientific and technical reports.

Who Should Attend?

Those who are working in façade engineering or those seeking career opportunities in this area.

The diploma is open to engineers, architects and suitably qualified candidates from other fields, including those engaged in the procurement, design, manufacture and assembly of building envelope systems, with a first degree or equivalent professional qualification.

Teaching Units and Classification

Introduction to Façade engineering
▪ Function of a Façade
▪ Performance Specification
▪ Quality and appearance
▪ Role of Façade engineer
▪ Design responsibility, & communication
▪ Safety requirements

Teaching Units and Classification

Introduction to Façade engineering

Aims:

To provide an introduction to façade engineering including the multi-functional nature of the building envelope and the need for holistic design.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Specify the performance of facades in terms of weather-tightness, structural integrity, environmental performance, quality and appearance.
- Understand the role of different professionals in the design and construction process.

Skills:

Critical assessment of the different drivers of façade design, understanding of the design conflicts and ability to resolve these with other building professionals. Written and oral communications. These skills are facilitated and assessed.

Content:

The role of the façade engineer, function of the façade, drivers of design including buildability, appearance, weather-tightness and appearance. Role of specification and verification of performance, and design responsibilities & communication.

Teaching Units and Classification

Façade materials and components
▪ Metals, CPC , GFRC, GRP, Stone ,stucco, glazing, masonry,& ceramics
▪ CPC Forming processes
▪ GFRC, GRP molding, spraying and casting processes
▪ Stone cladding treatments, finishes & installation details
▪ Durability and service life

Teaching Units and Classification

Façade materials and components

Aims:

To provide an understanding of the through life performance of the many materials used in façade construction.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Understand the primary performance of the many façade materials and their performance when used together and incorporated in complex assemblies.
- Evaluate, specify and verify the performance of materials.

Skills:

Selection of materials and design of appropriate assembly, mounting and other detailing. Critical evaluation of through life performance in practice.

Content:

Overview of materials including: GFRC, stone, metal, CPC, ceramic, polymeric, timber and fabric. Forming and assembly processes. Stone cladding treatments, finishes & installation details. Durability and processes of degradation.

Teaching Units and Classification

Glass and glazing
▪ Glass types
▪ Performance and safety
▪ Appearance of glass
▪ Glazing Treatments
▪ Glass selection process

Teaching Units and Classification

Glass and glazing

Aims:

To provide an understanding of the performance of glass for appearance, performance, integrity, safety and environmental control.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Specify the performance of glass.
- Critically evaluate the performance of glass and resolve design conflicts.

Skills:

Critical assessment of design objectives and achieved performance for glazed constructions.

Content:

Glazing materials, glass optical and thermal performance, glazing treatment, different glazing types, glass selection process, and fire resistance.

Teaching Units and Classification

Façade Production & Installation Process
▪ Design development process
▪ Value engineering studies
▪ Shop drawing preparation
▪ Material take off process
▪ Procurement process
▪ Installation and field testing
▪ As-built drawings

Teaching Units and Classification

Façade Production & Installation Process

Aims:

To understand the principles and methods of façade shop drawing preparation.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Understand all the required process for the shop drawings preparation.
- Awareness of the participant team from the shop drawing phase to the as built phase and the role of each member in each phase.

Skills:

Holistic review of façade detailing in a whole building context. Critical assessment of facade shop drawing detailing. Written and oral communications. These skills are facilitated and assessed.

Content:

Design development process, value engineering studies, quotation preparation, design validation, shop drawing preparation, support systems and interface design, procurement process, installation and field testing, record for final design.

Teaching Units and Classification

Structural analysis & Integrity of Façades
▪ Structural loads " horizontal & vertical"
▪ Design procedure
▪ Cladding design
▪ Design loading system
▪ Check building capabilities of transferred loads
▪ Construction Quality control process " lab tests & field tests"

Teaching Units and Classification

Structural analysis and integrity of façades

Aims:

To provide an understanding of the principles of structural engineering applicable to façade engineering and the structural performance of façades.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Analyze Structural loads " horizontal & vertical"
- Design procedures
- Cladding design and design loading systems
- Understand the structural design criteria for façades.
- Check building capabilities of transferred loads
- Construction Quality control process " lab tests & field tests"

Skills:

- Analysis and appraisal of the structural performance of complex facades.
- Presentation of complex results.

Teaching Units and Classification

Structural analysis and integrity of façades

Skills:

- Analysis of façade structures.
- Evaluation of structural performance.

Content:

Structural loads " horizontal & vertical" , design procedure, design loading system, check building capabilities of transferred load, quality control process " lab \ field tests, , role of structural analysis, structural materials, structural systems composite sections, structural design criteria, and applied & induced loads.

Teaching Units and Classification

Façade construction
▪ Methods of construction
▪ Accommodation of movement
▪ Interface design
▪ Fire performance

Teaching Units and Classification

Façade construction

Aims:

To provide an understanding of the principles and methods of façade construction.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Design and specify facades that meet the fundamental requirements of an envelope.
- Evaluate through life performance of a façade.

Skills:

Holistic review of façade detailing in a whole building context. Critical assessment of facade detailing. Written and oral communications. These skills are facilitated and assessed.

Content:

Methods of façade construction, support systems and interface design, building and cladding movement, sealing building envelopes, fire performance, access, maintenance and refurbishment.

Teaching Units and Classification

Façade procurement
▪ Industry structure
▪ Procurement routes
▪ Supply chain
▪ Value engineering

Teaching Units and Classification

Façade procurement

Aims:

To provide an understanding of the procurement of façades in terms of supply chain, specification, risk management and value engineering.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Evaluate the robustness of different design and procurement processes.
- Communicate the design, performance and construction requirements for a façade.

Skills:

Critical assessment of the effect of different procurement routes. Communication of design intent and project objectives.

Content:

The cladding industry, procurement methods, supply chain management, value engineering, quality management.

Teaching Units and Classification

Natural ventilation in buildings
▪ Ventilation strategies
▪ Role of the façade
▪ Passive and active solutions
▪ Façade control

Teaching Units and Classification

Natural ventilation in buildings

Aims:

- To develop a comprehensive knowledge of advanced principles and role of natural ventilation (NV) in buildings.
- To develop a critical awareness of the architectural consequences of (NV) on building design.
- To comprehensively explore the latest techniques, strategies and experiences of (NV) in buildings.

Learning Outcomes:

On successful completion of this module, students will have demonstrated the ability to:

- Comprehensively understand advanced principles and practices of (NV).
- Select and systematically employ appropriate and advanced NV strategies to different building types and complex contexts.
- Creatively integrate these with other passive design strategies.

Teaching Units and Classification

Natural ventilation in buildings

- Critically evaluate the (NV) performance of design options.
- Systematically diagnose the (NV) performance of existing buildings and recommend sound retrofit solutions if necessary.

Skills:

- Independent research and clear communication of design information and analysis in writing.
- Ability to apply advanced (NV) concepts in the design and detailing of buildings.
- Ability to critically diagnose the (NV) performance of existing buildings.

Content:

Natural ventilation(NV) strategies, air quality and indoor climate, driving forces of (NV), application of (NV), building design for (NV), detail design for (NV), analysis/design tools, regulation requirements, control/management in use, evaluation/diagnostic tools & techniques, passive and active solutions, mixed mode - Integration of natural with mechanical ventilation, (NV) and Mixed Mode ventilation case studies.

Teaching Units and Classification

Daylight and shading
▪ Natural light
▪ Photovoltaic panel
▪ Shading strategies
▪ Environmental Control

Teaching Units and Classification

Daylight and shading

Aims:

To provide a comprehensive theoretical grounding that will enable students to tackle the range of lighting strategies likely to be encountered in practice in relation to the control of natural light through the building envelope.

Learning Outcomes:

Upon successful completion of the Unit students will have demonstrated:

- Advanced knowledge of lighting theory and use of shading to reduce solar gain.
- A comprehensive understanding of the quality of light within buildings.
- The ability to independently assess and calculate the transmittance of shading devices and luminance derived from a conceptual understanding of the underlying theory.

Skills:

Appropriate analytical skills, interpreting diagrammatic information, communication skills.

These skills are taught, facilitated and assessed.

Teaching Units and Classification

Daylight and shading

Content:

Understanding daylight: benefits, challenges, different types, factors influencing availability. Defining daylight management: practice, shade positioning, benefits, design goals, and energy saving. Natural light as a working illuminant, role of shading to reduce solar gain, design of windows and advanced glazing.

Teaching Units and Classification

Weather-tightness
▪ Leakage mechanisms
▪ Weather-tightness and sealing
▪ Air leakage
▪ Testing

Teaching Units and Classification

Weather-tightness

Aims:

To provide an understanding of the principles, design and testing of the sealing of building envelopes.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Specify weather-tightness criteria and appropriate testing.
- Design joints and seals.
- Analyze the movement of moisture within walls.

Skills:

- Critical assessment of the different methods of sealing building envelopes.
- Ability to conduct tests for the assessment of constructed walls.

Content:

Air, water and wind environment, Gaskets, joints and interface design, weather-tightness testing, moisture movement in walls.

Teaching Units and Classification

Thermal performance of Façades
▪ Heat transfer
▪ Thermal Mass
▪ Solar passive design
▪ Condensation
▪ Design solutions
▪ Methods of assessment

Teaching Units and Classification

Thermal performance of façades

Aims:

To provide an ability to analyze and evaluate the thermal performance of façades.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Analyze energy transfer through complex façades.
- Interpret the thermal performance of façades.

Skills:

- Analysis and appraisal of the hygrothermal performance of complex facades.
- Presentation of complex results.

Content:

Heat transfer through complex assemblies and cavities, thermal performance of different forms of construction, performance of walls in warm and humid climates, interpretation of results.

Teaching Units and Classification

Green Building
▪ Introduction to built environment impacts and Sustainable design guide lines
▪ Rating systems and effect of efficient façades on related credits
▪ Technical treatments of façades and case study

Teaching Units and Classification

Green Buildings

Aims:

To provide comprehensive knowledge about green building techniques and sustainable envelope designs.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Analyze built environment impacts and Sustainable design .
- Interpret the thermal performance of façades.
- Gain diverse knowledge on the part of contractors and subcontractors, especially on green-building features.
- Exposure to wide range of new and emerging technologies, evaluation /certification programs, and even material selection criteria.

Skills:

- To adapt continually to new technologies and systems

Content:

Introduction to built environment impacts and Sustainable design guide lines, rating systems and effect of efficient façades on related credits, technical treatments of façades and case study, & thermal performance of different forms of construction.

Teaching Units and Classification

Thermal analysis of facades
▪ Climate condition
▪ Method of analysis
▪ Analysis of complex Components

Teaching Units and Classification

Thermal performance of facades

Aims:

To provide an ability to analyze and evaluate the thermal performance of façades.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Analyze energy transfer through complex façades.
- Interpret the thermal performance of façades.

Skills:

- Analysis and appraisal of the hygrothermal performance of complex facades.
- Presentation of complex results.

Content:

Heat transfer through complex assemblies and cavities, thermal performance of different forms of construction, performance of walls in warm and humid climates, interpretation of results.

Teaching Units and Classification

Acoustics & Fire
▪ Performance specification
▪ Sound transmission
▪ Fire classifications
▪ Design solutions
▪ Measurement and assessment

Teaching Units and Classification

Acoustics and Fire

Aims:

To provide a theoretical grounding that will enable students to strengthen the link between theory and design of acoustics and fire in buildings.

Learning Outcomes:

Upon successful completion of the Unit the students should be able to:

- Demonstrate an understanding of the analytical methods and practical techniques for the acoustic design of buildings and external noise environment.
- Demonstrate a knowledge of the fire performance of buildings and the role of façade design in achieving fire safety in and around buildings

Skills:

- Ability to analyze and modify the internal acoustic environment (taught, facilitated and assessed).
- Ability to select appropriate design strategies and components to produce facades that do not impair fire safety in buildings.

Teaching Units and Classification

Acoustics and Fire

Content:

Room acoustics: introduction to the decibel, sound propagation, sound in rooms, absorption, reverberation time and room acoustic design. External noise environment. Noise control: sound insulation by partitions, cavity constructions in masonry, glass and light-weight materials, acoustics properties of building envelopes, practical solutions and current legislation. Principles of fire engineering. Fire resistant construction. Reaction of facades to fire.


Thank
you!