(GRADUATE STUDIES)

Master of Science Programs

STATUS REPORT

NOVEMBER 2008
Architectural Engineering and Environmental Design

M.Sc. Programs
Program Detailed Structure

M.Sc. Programs
# M.Sc. in Architectural Engineering and Environmental Design

## Program Structure

### Core Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AR 713</td>
<td>Environmental Studies in Architecture and Urban Design</td>
<td>3</td>
</tr>
<tr>
<td>AR 715</td>
<td>Architectural Design</td>
<td>3</td>
</tr>
<tr>
<td>AR 717</td>
<td>Urban Design</td>
<td>3</td>
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</tbody>
</table>

**Subtotal**: 3 Courses * 3 Credit Hours = 9

### Elective Courses:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>AR 721</td>
<td>Passive and Active Environmental Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>AR 722</td>
<td>Environment and Behavior: Applications in Architecture and Urban Design</td>
<td>3</td>
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<tr>
<td>AR 723</td>
<td>Site Development and Landscape Studies</td>
<td>3</td>
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<tr>
<td>AR 724</td>
<td>Theory of Architecture: Advanced Topics</td>
<td>3</td>
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<tr>
<td>AR 725</td>
<td>Design Principles in Digital Era</td>
<td>3</td>
</tr>
<tr>
<td>AR 726</td>
<td>Environmental Design Approaches</td>
<td>3</td>
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<tr>
<td>AR 727</td>
<td>Egyptian Regions and Architecture</td>
<td>3</td>
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<tr>
<td>AR 728</td>
<td>Sustainability and Urban Form</td>
<td>3</td>
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<tr>
<td>AR 729</td>
<td>Architectural Criticism</td>
<td>3</td>
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<tr>
<td>AR 731</td>
<td>Urban Development and Urban Renewal</td>
<td>3</td>
</tr>
<tr>
<td>AR 732</td>
<td>Mediterranean Cities: History, Spirit and Contemporary Architecture</td>
<td>3</td>
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<tr>
<td>AR 733</td>
<td>Computer Applications in Design and Presentation</td>
<td>3</td>
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<tr>
<td>AR 734</td>
<td>Geographic Information Systems</td>
<td>3</td>
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<tr>
<td>AR 735</td>
<td>Conservation of Architectural Heritage</td>
<td>3</td>
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<tr>
<td>AR 736</td>
<td>Research Methods</td>
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<tr>
<td>AR 737</td>
<td>Urban Environmental Planning</td>
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<tr>
<td>AR 738</td>
<td>Urban Landscape</td>
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<tr>
<td>CB 711</td>
<td>Value Engineering in the Construction Industry</td>
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<tr>
<td>CB 712</td>
<td>Advanced Construction Management</td>
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<tr>
<td>CB 717</td>
<td>Project Planning and Control</td>
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<tr>
<td>CB 710-C</td>
<td>Construction Productivity</td>
<td>3</td>
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</table>

**Subtotal**: 5 Courses * 3 Credit Hours = 15

*continued/…*
M.Sc. in Architectural Engineering and Environmental Design
Program Structure

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**RESEARCH THESIS:**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>AR 701</td>
<td>Master's Research Thesis (Part 1)</td>
<td>6</td>
</tr>
<tr>
<td>AR 702</td>
<td>Master's Research Thesis (Part 2)</td>
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<td>Subtotal</td>
<td>2 Parts * 6 Credit Hours</td>
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<td>Total</td>
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</tbody>
</table>
Course Detailed Structure

Course Code : AR 713
Course Title : Environmental Studies in Architecture and Urban Design
Credit Hours : 3

Course Description
This course discusses the issue of environmentally conscious design. It consists of four main parts: (1) The philosophy of environmental design; (2) The physical environment including geology, geomorphology, surface water, topography and climate and their influence on building and site design; (3) The natural environment including soils, plants, vegetation, and ecology; and finally, (4) The social environment, land use, and land management.

Course Objectives
On completion of the course, students should be able to perform an environmental site analysis of various projects based on their knowledge of user requirements and different physical aspects.

Course Topics
- What is meant by “Environment”?
- What constitutes an “Environmental Conscious Design?”
- Environmental Ethics
- The Physical Environment: Geology, Geomorphology, Surface Water, Underground Water, Topography, the Macroclimate, the Microclimate
- The Natural Environment: Soils, Plants, Vegetation, Ecology
- The Social Environment
- Land Uses
- Land Management

References
Course Detailed Structure

Course Code : AR 715
Course Title : Architectural Design
Credit Hours : 3

Course Description
This module focuses on how architectural graduates should be committed with the rationales of the design process, approach, and proposal. It defines, tests, and justifies how a design proposal is appropriate and relevant in a particular physical, social, cultural, economic or environmental context. It also rehearses the student's ability to deliver a well developed, ambitious and resolved design proposal which has taken into account the complex and unpredictable conditions of a particular context and embodies within its rationale, scale, scope and remit, a well developed ambition for architecture.

Course Objectives
This advanced level design module rehearses the student's ability to construct an ambitious, sophisticated and appropriate brief, program and conceptual rationale for their design proposals and final products.

Course Topics
- New Trends in Architectural Design
- Architectural Design and Digital Forms
- Digital Responses to Environment
- Experimental Project
- Research and Programming
- Site Analytical Studies
- Searching of Ideas and Design Approaches
- Evaluation
- Implementation of Projects
- Post Project Analysis

References
Course Code : AR 717
Course Title : Urban Design
Credit Hours : 3

Course Description
Through an examination of the nature of traditional urban spaces, several fundamental principles of spatial structure emerge. In most modern cities these principles have been lost, resulting in what is referred to as 'anti-space' or 'lost space.' The course discusses different aspects of this loss and suggests different ways for designers to restore traditional values and meanings to contemporary urban open spaces.

Course Objectives
This module enhances the student’s capabilities through developing her/his knowledge of urban spatial design principles. Discussions are combined with the study of practical applications and strategies for correcting the problems of spatial structure in the modern city in general and the Egyptian cities in particular.

Course Topics
- The problem of urban design today: Causes, Aspects and effects
- Development of late 20th Century Urban Space Design Theory
- Urban space precedents
- Different theories and approaches of urban spatial design
- Toward an integrated theory to urban design of twenty first century
- Case studies and examples
- Applications

References
Course Code: AR 721
Course Title: Passive and Active Environmental Control System
Credit Hours: 3

Course Description
This course deals with a number of passive and active environmental systems topics. First, it presents empirical environmental design guidelines in literature and their applications. Second, it introduces methods of calculating thermal loads and ways of minimizing these loads in buildings. Third, the course then introduces the concept of energy consumption software as a design tool. Finally, it looks at active energy generation opportunities and how to integrate them in building and site design.

Course Objectives
On completion of the course, students should be able to perform computerized load calculations and utilize ways of reducing energy consumption. They should also be able to analyze energy consumption components and choose the best solution out of a list of alternatives.

Course Topics
- Human Comfort and Health Requirements
- Thermodynamic Principles
- Thermal Dynamics of Buildings
- Load Calculations: Heating Load Calculations, Cooling Load Calculations
- Selecting Design Temperatures and Humidity Conditions
- Solar Gain Through Fenestration
- Transmission through the Envelope
- Internal Loads, Outside Air
- Annual Energy Use Calculations
- Hourly Computer Simulations
- Active HVAC Systems, Load Reductions

References
Course Code : AR 722
Course Title : Environment and Behavior: Applications in Architecture and Urban Design
Credit Hours : 3

Course Description
This course introduces graduate students to the field of human behavior by drawing from theories of environmental psychology and environmental ecology. Perception, cognition, evaluation and attitudes are examples for some topics to be explored at different scales and settings.

Course Objectives
This program bridges a presumed gap of theory and practice and acquaints the students with terms and theories of environment and behavior, while deepening their understanding of human behavior in multi-cultural settings in order to enhance the students’ performance in other design classes should be enhanced.

Course Topics
- Introduction to Environment and behavior studies
- Historical account for behavioral sciences and its development
- Environmental Psychology: focus and fields of interest
- Perception, cognition and evaluation
- Behavior settings theory
- Applications: personal space, territoriality, place attachment
- Image of the city
- Cities by design: The physical environment and urban living
- Public spaces and human behavior
- Crowdedness: research, policy implications
- Cultural aspects of environment and behavior research

References
- Readings are available for each week separately.
Course Detailed Structure

**Course Code :** AR 723

**Course Title :** Site Development and Landscape Studies

**Credit Hours :** 3

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**Course Description**

This course places an emphasis on the rehabilitation, redevelopment and conservation of urban environments. Projects include the application of urban ecology, environmental psychology and historic evolution. The course also encourages students to generate ideas regarding the transformation of our ailing cities into thriving and efficient urban environments.

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**Course Objectives**

The students should find new and constructive ways of looking at the physical environment of cities via an alternative basis for urban landscape form that is in tune with growing awareness of - and concern for - the issues of energy, environment and natural resource conservation.

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**Course Topics**

- Urban ecology: A basis for design
- City form and natural process
- Making Connections
- Creating a livable urban environment
- Garden Cities 21
- Sustainable landscape

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**References**

Course Detailed Structure
Arch. Eng. and Environmental Design

Course Code : AR 724
Course Title : Theory of Architecture: Advanced Topics
Credit Hours : 3

Course Description
This course introduces students to the era of modernism and the master designers of these schools. It provides a critical viewpoint for several architectural ideological trends and approaches which have evolved since the 1960s, until modern times. This course leads to a better understanding of the late 20th Century and the beginning of the 21st Century.

Course Objectives
This course increases the understanding of new architectural trends and their founders in the very recent past, the running present and the coming future.

Course Topics
- Theories of architecture and design approaches
- Approaches to analysis and synthesis of forms
- New trends and architectural design theories
- The role of symbolism in architectural forms
- Architectural theories between culture and environment
- Articulation of functions, forms and technology
- Analytical studies of the latest projects

References
Course Detailed Structure

Course Code : AR 725
Course Title : Design Principles in Digital Era
Credit Hours : 3

Course Description
The students are introduced to the general concepts of the digital effect on architecture and leaders of the world in these trends. Current use of computers in architecture and the evolution of the digital design process parametric design and their wider implications for the future are studied, as well as the exploration of principles of digital creativity.

Course Objectives
This course discusses the effect of the digitally driven changes in an architectural practice in which technologies are radically changing how the buildings are conceived and realized by grounding them in actual practices already taking place.

Course Topics
- Digital Master Builders
- Digital Morphogenesis
- New Materiality
- Digital Responses to Environment
- Architectural Design and Digital Forms
- Construction of Digital Forms
- 3D Design and Computer Programs
- Architect as a case study from the post-modernism

References
Course Detailed Structure

Course Code : AR 726
Course Title : Environmental Design Approaches
Credit Hours : 3

Course Description
In this course the students will develop an understanding of the relationships among the ecosystem, energy, resource flows and human social and cultural values. Various methods of preserving, protecting and improving the quality of the environment through rational utilization of natural resources will be discussed as well as protecting human health by reducing air pollution through better design and urban development.

Course Objectives
This course introduces graduate students to the principles of environmental design and how the site, form, materials and structure can be used to design comfortable, healthy and energy efficient buildings.

Course Topics
- Comfort, health, environmental physics
- Energy strategy method:
- Building planning and design
- Energy sources
- Services design
- Energy conservation:
- Active and passive methods
- New technologies,
- Intelligent building
- Waste minimization and recycling technology
- Case studies of environmental buildings

References
Course Code : AR 727
Course Title : Egyptian Regions and Architecture
Credit Hours : 3

Course Description
The course discusses a variety of regions in Egypt (Sinai, Nubian Regions, Delta, Western Desert, and Eastern Desert) by presenting the evolution, transformation and the development of architecture in each of these regions. A group of students will choose a region to be studied according to their scope of interest in the field. The chosen topic will be dealt with, on two stages. The First Stage is theoretical background of the chosen subject, which would be prepared by the lecturer. Through Second Stage, the Student will make a research work of a Case Study on which to apply the theories and criteria extracted from the theoretical background of stage one. The students will present their work for discussion and criticism.

Course Objectives
The course aims to enhance the students’ understanding of Egyptian regions by focusing upon several aspects related to various scopes of interest in several areas (historical, climatic, construction, etc…).

Course Topics
- Dwellings and Settlements in African Architecture
- Dwellings and Settlements in the Egyptian Regions
- Historic Building in Egyptian Regions (Methods and Techniques)
- Building Cultures and Sustainable Developments
- Vernacular Architecture
- Traditional Environments

References
- According to the topic to be dealt with.
Course Detailed Structure

Arch. Eng. and Environmental Design

Course Code: AR 728
Course Title: Sustainability and Urban Form
Credit Hours: 3

Course Description
This course highlights various sub-ecological approaches. It helps provide a clear understanding of the urban form and its different types. Students will develop knowledge about the factors affecting energy consumption and consequently affecting the urban form.

Course Objectives
The course aims to elaborate the concept of sustainable development and energy consumption and their direct influence on the urban form.

Course Topics
- Definition of sustainability
- The built environmental and sustainability
- Ecological dimension of sustainability
- Sustainable urban form
- Different approaches of achieving sustainable urban form

References
Course Detailed Structure

Course Code : AR 729
Course Title : Architectural Criticism
Credit Hours : 3

Course Description
This seminar-like course introduces graduate students to the realm of architectural criticism. Students' curiosity to the subject is based on their experience with architectural design classes and instructors' evaluations. The course deals with the topic as a methodology and expression of ideology.

Course Objectives
Criticism is judgment flavored by one's sphere of interaction. Students should learn how to look and interpret behind-the-scene phenomena, and not to be biased by tempting forms or presentations. The objectives that students should gain: knowledge about criticism and its importance for theory and practice of architecture, curiosity, Suspicion, Link knowledge in different fields (art, science, ...etc.), the ability to view things as "wholes", the way of Developing a “theoretical” model for understanding architectural form as synthesis for a multiplicity of forces or factors (socio-cultural, political, environmental, technological…etc.), learning about development of architectural theory and practice of the twentieth century, learning that architecture goes hand in hand with urban design as concrete formulations to prevailing discourses.

Course Topics
- Introduction to criticism in the fields of the social sciences, and art (art, music, and architecture)
- Architectural theory and practice I
- Language of architecture I
- Modernity, Positivism and the post-positivism era I
- A model for understanding criticism

References
Course Detailed Structure

Course Code : AR 731
Course Title : Urban Development and Urban Renewal
Credit Hours : 3

Course Description
This seminar-like course introduces graduate students to different philosophies of urban development and renewal. The course initiates discussion and different concepts of development and renewal in different areas of the world with various world views.

Course Objectives
Following the philosophical background of this specific degree (Master of Science in Architectural Engineering and Environmental Design), the course tackles a cornerstone of policy and action that affects the surrounding environment. Dealing with developmental issues raises students’ awareness toward the environment and furnishes solid ground for future research.

Course Topics
- Development vs. Growth Conceptualization, epistemology and philosophies
- Meanings of urbanity and urbanization theories
- Dimensions of development: social, economic, political, environmental, etc…
- Scales and contexts of urban development
- New towns policy and implementation
- Urban renewal programs
- International and national examples, critique
- Ecological perspectives of development

References
- Readings are available for each week separately. These are picked from journals and chapters from texts dealing with the topic of development.
Course Detailed Structure

Course Code : AR 732
Course Title : Mediterranean Cities: History, Spirit and Contemporary Architecture
Credit Hours : 3

Course Description
The aims of this course are to understand the different physical, social and temporal aspects that have shaped the different common characteristics of Mediterranean cities. Detailed analysis of one Mediterranean city will take place as a case study. The analysis will include the different geographic, historical, social, political and cultural factors that have shaped the physical aspects of the city. Relationships between economic growth and urban development will be introduced. General and common physical characteristics of Mediterranean cities will be emphasized.

Course Objectives
To understand the different physical, social and temporal aspects that have shaped the different common characteristics of the Mediterranean cities. Also to understand the applications of the different spatial design theories.

Course Topics
- Choice of the case study
- Urban development through different periods
- Physical characteristics of the city
- Detailed analysis of key sites of the city
- General identity of the city and specific identity of its parts
- Contemporary issues of conservation
- Expectations and future directions

References
Course Detailed Structure

Course Code : AR 733
Course Title : Computer Applications in Design and Presentation
Credit Hours : 3

Course Description
This course will illustrate general presentation techniques and state of the art concepts that are currently utilized in architectural practice. Many computer packages are necessary for this course, including AutoCAD, 3D Studio Max, Adobe Photoshop, Adobe Premier, MS PowerPoint, MS FrontPage and more. The aim is to incorporate all these packages into one integrated output that represents an architectural project.

Course Objectives
The course provides hands on experience to students seeking the use of available presentation tools currently in the market. It gives students the opportunity to test their presentation abilities on their fellow-students, listen to their comments, and apply changes that makes their presentations more appealing. The course also provides an open ground for cross-learning activities, that is, students would exchange ideas, software, and presentation tricks. Thus, enhance the students’ ability and understanding to both the theoretical and practical sides of making successful presentations.

Course Topics
- Brushing-up AutoCAD 2D
- 3D in action
- Linking AutoCAD projects with 3D Studio VIZ
- Working with Links
- File and data exchange
- Manipulated Data Formats
- Compiling everything together
- Presentation Techniques
- Assembling Story Board
- Oral Presentation Roles
- Applying Presentation Tools

References
- As the course deals with multiple computer applications, no single textbook can entirely cover the teaching material. Instead, handouts will be given to the students as needed.
**Course Detailed Structure**

**Course Code**: AR 734

**Course Title**: Geographic Information Systems

**Credit Hours**: 3

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**Course Description**

This course provides graduate students with an opportunity to gain advanced knowledge of the application of geographical information systems (GIS) on environmental problems with particular reference to planning and resource management. Students will become familiar with the strengths and limitations of this rapidly developing approach to the analysis of spatial data.

**Course Objectives**

By the end of that course, student will gain an understanding of the concept of GIS and its applications. She/He will be able to deal with different types of data and know the way to transfer this data to the language of GIS and finally, how to obtain different results using that package.

**Course Topics**

- With application on a case study, the following topics would be introduced:
  - Overview of Geographic Information System
  - Maps, Map Projection and Coordinate System
  - Spatial Data Model
  - Data Quality, Sources, Input and Output
  - Database Concept
  - Spatial Analysis
  - Making and Producing Maps
  - Implementation
  - The Future of GIS

**References**

Course Detailed Structure

Arch. Eng. and Environmental Design

Course Code : AR 735
Course Title : Conservation of Architectural Heritage
Credit Hours : 3

Course Description
Students are introduced to the general concepts of architectural conservation. They are also exposed to the structural aspects of historic buildings in some detail. The course discusses the causes of decay in materials and structure. Finally, conservation projects, including the Aga Khan Award for Architecture are highlighted.

Course Objectives
While historic structures range from modest to monumental, and encompass a remarkable variety of materials and uses, approaches to their conservation are governed by core principles and determined by well-developed standards of practice. This course enhances the understanding of the complex characteristics of heritage structure, values, systems, and materials, and provides frameworks for planning and managing appropriate conservation process. This course also tackles the problem of cultural discontinuity and demonstrates contemporary trends, through the Aga khan award, towards achieving cultural continuity.

Course Topics
- Building materials and systems commonly encouraged in heritage structures
- The nature and extent of deterioration in building materials and systems
- Conservation strategies
- The Aga Khan Award for Architecture
- Contemporary Trends toward cultural Continuity

References
Course Detailed Structure

Course Code: AR 736
Course Title: Research Methods
Credit Hours: 3

Course Description
The course provides graduate students with an overall understanding of the nature of academic research. It highlights the principal basics of doing research, its requirements and logic. The course should help students develop their ability to devise specific research programs, tackle different problems throughout the stages of work, analyze data, induce statements and conclusions, and finally organize findings into thoroughly written dissertations and theses.

Course Objectives
The course aims to present a brief overview of the field of academic research. It introduces various methods and techniques for conducting research and producing complete research documents. The seminar-like course presents further insight into research methodologies, critical investigations, qualitative and quantitative methods, and provides a broad understanding of the research fundamentals, standards, and common procedures.

Course Topics
- Academic Research: Concepts and Keywords
- Logical Reasoning in Research
- Research Approaches and Typologies
- Research Designs
- Data Collection Techniques
- Documenting Sources: Alternative Styles
- The Writing-Up Stage
- Applied Research Methods

References
Course Detailed Structure

Course Code : AR 737
Course Title : Urban Environmental Planning
Credit Hours : 3

Course Description

Urban environmental planning is planning that includes environmental criteria in decision making, as well as filtering steps that lead to a completion of a design. To achieve environmental planning it is imperative that the entire planning method, approach and discipline be overhauled. Every component, guideline and mark of the pen must consider the implications of the environmental objective. As such, the course deals with different aspects related to the planning of urban areas. It explains how uncontrolled urbanization has altered the natural and social systems, and how it is possible through evolving environmentally conceived concepts in planning, to formulate a better urban environment.

Course Objectives

To evolve student's thinking to embrace environmental planning methodology with respect to intervention in our urban environment. The intent is to focus the discussion on built structures and spaces but with the expressed undercurrent of applying these lessons, strategies and solutions to all aspects of human society. Full participation and offering of personal point of views and experiences is expected to enhance and broaden online classroom debate.

Course Topics

- The Natural Systems: Biotic and Abiotic systems
- Nature in urban areas
- Pollution in urban areas
- Sustainable Development and Planning
- Environmental Planning Concepts and Pioneers
- The Socio-Economic Environment
- New trends in urban environmental planning
- The urban environmental planning framework and guidelines
- Anatomy and analysis of a pilot case study in Egypt

References

Course Detailed Structure

Arch. Eng. and Environmental Design

Course Detailed Structure

Arch. Eng. and Environmental Design

Course Code : AR 738
Course Title : Urban Landscape
Credit Hours : 3

Course Description
This course explores landscape design theories and application in the urban context. It looks at site structure relationships for private buildings, urban open spaces, plazas, pedestrian malls and other public spaces. Case studies will be used to apply and develop these principles under the supervision and guidance of the instructor.

Course Objectives
The course aims to introduce students to the concept of landscape architectural design theories and applications on different scales of urban environments.

Course Topics
- Perception of urban landscape
- Structure of urban space
- Development of spatial order
- Radial and Neoclassic form

References
Course Detailed Structure

Course Code : CB 711
Course Title : Value Engineering in the Construction Industry
Credit Hours : 3

Course Description

Course Objectives
To provide students with and understanding of the concepts of value engineering and its applications in the construction industry.

Course Topics
- Value engineering concepts and definitions
- Value engineering study process and procedures
- Function analysis
- Level of abstraction and selection of alternatives
- Evaluation techniques
- Presenting value studies
- Whole life cycle costing
- Construction case studies and applications

References
Course Detailed Structure

Course Code : CB 712

Course Title : Advanced Construction Management

Credit Hours : 3

Course Description
General characteristics of the construction industry and the general aspects and nature of construction management. Further management and business topics include: strategic management; risk management; human resources management; health and safety in construction; organizational behavior; business performance management; quality management, environmental management and process management.

Course Objectives
To develop an understanding of general management and business topics relating to construction.

Course Topics
- Characteristics of the construction industry
- Aspects and nature of construction management
- Strategic management
- Risk management
- Human resources management
- Health and safety in construction
- Organizational behavior
- Business performance management
- Quality management
- Environmental management
- Process management

References
Course Detailed Structure

Course Code : CB 717
Course Title : Project Planning and Control
Credit Hours : 3

Course Description

Course Objectives
To provide students with advanced knowledge and skills concerned with planning and control of construction projects.

Course Topics
- Advanced planning and scheduling methods in construction
- Resource constrained scheduling, probabilistic scheduling and line-of-balance.
- Cost planning and design of costing systems in construction projects
- Acceleration of construction projects
- Tracking project progress – time and costs
- Forecasting and controlling project cash flows
- Earned-value systems in controlling construction projects

References
Course Detailed Structure

Arch. Eng. and Environmental Design

Course Code : CB 710-C
Course Title : Construction Productivity
Credit Hours : 3

Course Description

Course Objectives
To provide a knowledge of the productivity concepts and in the construction industry.

Course Topics
- Productivity engineering and management
- Factors of productivity
- Productivity measurement methods
- Total productivity model
- Optimum allocation of resources
- Productivity improvement techniques

References