



**ARAB ACADEMY FOR SCIENCE, TECHNOLOGY  
AND MARITIME TRANSPORT**

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**COLLEGE OF ENGINEERING  
AND TECHNOLOGY**

**( GRADUATE STUDIES )**

**Master of Science Programs**

**STATUS REPORT**

**ALEXANDRIA**

**2012**

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# **CONSTRUCTION AND BUILDING ENGINEERING**

**M.Sc. PROGRAMS**

## **M.Sc. in Construction and Building Engineering**

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### **OVERVIEW**

Construction is one of the largest nation's industries, encompassing an incredibly wide range of activities, from high-rise buildings construction to homes, from highways to power plants. Indeed modern construction projects have become so large, complex, expensive and time-consuming that special educational programs now are being offered to prepare students for entry into this important and challenging industry.

The mission of the Construction and Building Engineering Department at the AASTMT is to provide the educational, research, and training programs that serve both the needs of our students and those of the construction industry. The curriculum objective is to prepare individuals for a professional career in construction engineering and management and for continued learning through post-graduate education or self study.

The department offers a B.Sc., a diploma, and a Master's degree in Construction Engineering. As a student in construction engineering, you will learn to identify the best methods and techniques of construction, to determine construction costs and set schedules, to apply methods of quality control and to supervise construction projects.

The program is designed to prepare our students to become outstanding construction engineers, whose job is to devise and design construction facilities, coordinate and direct the efforts of labor and equipment, and control the time and cost demands of field operations.

As they gain experience, construction engineers become construction managers who combine engineering, management, and field construction skills in the administration and management of field construction.

Graduates of the Construction and Building Engineering degree program design and manage construction processes that create living and working environments such as office buildings, industrial buildings, airports, housing, roads, bridges, utilities, and dams. Graduates fill positions in construction companies, engineering consulting firms, government agencies, and large construction corporations. The positions usually involve either the planning, design, and management of the construction process for a general, specialty, or mechanical contractor, or the coordination, inspection, and management of design, contracts, or facilities for a business, industry or government owner.

When you ask top managers in construction and engineering firms why they selected this career, you can hear the excitement of the construction industry in their responses. Some say they like to conceive an idea and then engineer and manage it through to reality. Others say that they like the combination of computerized planning, process design, cost engineering, and scheduling with the gratification of seeing a job well done.

Graduates of this degree program enjoy a wide range of opportunities to apply their technical knowledge with tremendous variety in the day-to-day work. Some choose design, planning, or financial management positions working in an office environment, while others prefer to direct field operations or some combination of the above.

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## **Program Detailed Structure**

**M.Sc. PROGRAM**

**(E) TRANSPORTATION ENGINEERING**

## M.Sc. in Construction and Building Engineering

### Program Structure

(E) Transportation Engineering

## M.Sc. in Construction and Building Engineering

(E) Transportation Engineering

### CORE COURSES:

<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
CB 750	Transportation Planning and Management	3
CB 751	Traffic Flow Modeling Theories	3
CB 752	Highway Material , testing , Equipments & Maintenance	3
CB 753	Advance Structural Design of Highway & Airport Pavement	3
CB 754	Advanced Geometric Design for Highway & Airport	3
CB 755	Numerical Approaches for Transportation & Highway Problems	3
CB 756	Transportation Data Collection & Analysis	3
CB 757	Special Topics in Airport & Railway Engineering	3
CB 758	Geographic Information System for Construction Engineering	3
<b>Subtotal</b>	<b>8 Courses * 3 Credit Hours</b>	<b>24</b>

### RESEARCH THESIS:

<b>Course Code</b>	<b>Course Title</b>	<b>Credit Hours</b>
CB 701	Master's Research Thesis (Part 1)	6
CB 702	Master's Research Thesis (Part 2)	6
<b>Subtotal</b>	<b>2 Parts * 6 Credit Hours</b>	<b>12</b>

<b>Total</b>	<b>36</b>
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# Courses

DETAILED STRUCTURE

**Course Code :** CB 750

**Course Title :** Transportation Planning and Management

**Credit Hours :** 3

### Course Description

The course covers topics in the area of transportation planning (transportation problems, trends in transportation planning), urban transportation planning (elements of planning, planning process, goods movement planning), forecast of urban transport demand (data collection and analysis, goals and objectives, aggregate sequential demand models), sketch planning and project planning (generation, analysis and evaluation of alternative plans, risk and uncertainty).

### Course Objectives

The course aims at introducing the graduate student to the Urban Transportation Planning Process . Also , the Transportation Management System process.

### Course Topics

- Urban Transportation Planning
- Sequential Demand Forecasting Models
- Trip Generation Models
- Trip Distribution Models
- Modal choice Models
- Network assignment application
- Decision Making in Transportation Management and Planning
- Multiple – Objective Evaluation & Selection Methods
- Long Range Transportation Planning
- TSM planning
- Evaluation of Transportation Improvement

### References

- *Highway Engineering* by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- *Standard Handbook for Civil Engineers* by F.S. Merrit Publisher: McGraw Hill book NY
- *Pavement Management for Airports, Roads and Parking lots* by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- *Egyptian Code for Highway* by Ministry of Urban Planning Publisher: Latest Edition.
- *Transportation and traffic Engineering Handbook* by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- *Handbook of Highway Engineering* by R. Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 751

**Course Title :** Traffic Flow Modeling Theories

**Credit Hours :** 3

### Course Description

This course covers topics in the area of traffic flow characteristics, principles of traffic, basic freeway capacity, multilane highway capacity, flow interruption, traffic signals, statistical distribution of traffic characteristics.

### Course Objectives

The course aims at introducing the graduate student to the Fundamentals and advanced Traffic Flow Theories for highway Engineering.

### Course Topics

- Traffic flow characteristics, volume, flow, PHF and variation of traffic volume
- AADT, ADT, DHV, speed-density model, flow-density model and speed-flow model
- principles of traffic flow, level of services
- Basic freeway capacity
- Multilane highway capacity and two lane highway capacity
- Flow interruptions
- Intersection control and design
- Traffic signals
- Intersection capacity
- Measurement of flow , speed , density
- Queueing theory Approaches including delays at intersection
- Statistical Distributions of traffic characteristics
- Traffic Stream Modeling
- Simulation of Traffic Flow
- Shock wave propagation , Principle & Application

### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.



- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 752

**Course Title :** Highway Material , testing , Equipments & Maintenance

**Credit Hours :** 3

### Course Description

Soil engineering for highway projects, materials used in highway construction, highway layers, highway material testing, highway construction equipment, calculation of productivity for each equipment, maintenance of asphaltic and concrete highways and earth roads.

### Course Objectives

The course aims at collecting main subjects relevant to the construction of highway to the graduate student . The main issue is to include the four modules of Material , Testing , Equipment & Maintenance together in one Course .

### Course Topics

- Soil engineering for highway Projects
- Material used in highway construction
- Subbase layer , base layer , surface layer
- Highway material Testing
- Los Angeles Test
- CBR Test
- Extraction Test
- Marshall Test
- Gyrotory Compactor Test for super pave
- Binding Asphalt common tests
- Highway Construction Equipments
- Calculation of productivity for each equipment [ subgrade , subbase , base , surface ]
- Maintenance of asphaltic highways (failure of flexible pavement - pavement distress - maintenance methods)
- Maintenance of concrete highways (failure of rigid pavement - maintenance of cracks and joints-strengthening of pavement
- Maintenance of earth roads (earth problems- maintenance of earth roads), methods of measuring effects

### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.

- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 753

**Course Title :** Advance Structural Design of Highway & Airport Pavement

**Credit Hours :** 3

### Course Description

Pavement types, flexible pavement stresses and deflections, the AASHTO flexible pavement, serviceability concept, principles for rigid pavements, the ASSTHO rigid pavement design procedure, pavement rehabilitation management, the FAA method of design, CBR method of design for flexible airport pavements, super pave design method, gyratory compaction test.

### Course Objectives

The course aims at combining simplified, sophisticated methods for structural design of highway & airport pavement. In addition, to introduce the graduate student to the super pave method and the effect of gyratory compactor on it.

### Course Topics

- Pavement types, flexible and rigid pavement
- Flexible pavement stresses and deflections
- The AASHTO flexible pavement design procedure
- Serviceability concept, structural number
- Principles for rigid pavements
- The AASHTO rigid pavement design procedure
- Pavement rehabilitation management
- The FAA method of design for flexible and rigid airport pavements
- CBR method of design for flexible airport pavements, pavement design using elastic layer theory
- Super pave Design Method
- Gyratory Compaction Test

### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 754

**Course Title :** Advanced Geometric Design for Highway & Airport

**Credit Hours :** 3

### Course Description

The course covers advanced topics in the area of horizontal alignment which includes development of super-elevation with/without transition (spiral) curves, design values for spiral parameters. Also it covers vertical alignment which includes maximum and minimum gradient, critical length of grade, passing lanes, emergency escape lanes, vertical curves, crests and sags for SSD and PSD.

### Course Objectives

The course aims at introducing the graduate student to the Advanced topics in geometric design of highway and airport Engineering.

### Course Topics

- Basics of Horizontal & Vertical Alignment
- Details of Transition Curve Usage
- Excel development for Super elevation levels [ CL, OE, IE ]
- Production of Mass Diagram [ rate change in cut & fill ]
- Haul distance calculation and over distance
- Relation between HC & VC and role of sight distance and 3D evaluation of Highway Center line
- At-Grade Intersection design
- Details of Roundabout design
- Grade Separation Interchange
- Loop Designer
- Ramp Designer
- Semi Direct Trumpet Designer
- Full Cloverleaf , Partial cloverleaf Designer
- Diamond Designer
- Trumpet Designer Designer
- Fully Directional Interchange Designer

### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.

- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 755

**Course Title :** Numerical Approaches for Transportation & Highway Problems

**Credit Hours :** 3

### Course Description

Single and multiple regression approaches, traffic macro and micro simulation approaches, application of finite difference method, application of boundary element methods, applied finite element method to vehicle-ground interaction problems.

### Course Objectives

The course aims at introducing the graduate student to familiar Numerical Approaches used widely in tackling various Transportation & Highway problems.

### Course Topics

- Single & Multiple Regression Approaches [ Linear & Nonlinear ]
- Traffic Macro simulation Approaches
- Traffic Micro simulation Approaches
- Application of Finite Difference method for various highway problems
- Application of Boundary element methods for various highway problems
- Applied Finite Element Method to Vehicle-Ground Interaction Problems
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### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition.
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition..

**Course Code :** CB 756

**Course Title :** Transportation Data Collection & Analysis

**Credit Hours :** 3

### Course Description

Integrated traffic monitoring system, weigh in motion systems, automatic traffic recorder, the effect of length of collection period, traffic ratio vs traffic factors, pavement condition data collection, method of measuring roadway condition, pavement roughness data collection, pavement distress data collection, PCMS, measuring pavement structural condition, roadway skid resistance data collection.

### Course Objectives

The course aims at introducing the graduate student to the various techniques adopted in collecting data pertaining to transportation & highway issues . In addition , the different approaches to analyze such collected data.

### Course Topics

- Integrated Traffic Monitoring System ITMS
- Weigh-In-Motion System WIMS
- Automatic Traffic Recorder ATR
- The Effect of Length of Collection Period for WIM Data
- Traffic Ratios versus Traffic Factors
- Partial-Day Classification Counts and Truck Traffic Distribution Factors Simple versus Weighted Averages
- Pavement Condition Data Collection
- Methods for measuring Roadway Condition
- Pavement Roughness Data collection
- Pavement distress data collection
- Pavement condition Monitoring System PCMS
- Measuring Pavement structural condition
- Roadway skid resistance data collection

### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R. Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 757  
**Course Title :** Special Topics in Airport & Railway Engineering  
**Credit Hours :** 3

#### Course Description

Airport classification and site selection, wind analysis and wind rose construction, determination of runway basic length and corrections, aircrafts, components of airports, overall airport site, runways and holding aprons configurations, classification of airports soils, rail way engineering: definition, components of railway system, cross section basic design , railway platform, length, switching, signaling.

#### Course Objectives

The course aims at introducing the graduate student to both the basics of airport engineering and railway engineering in one designed graduate course to fill any possible gap in his/her undergraduate study.

#### Course Topics

- Airport Classification & Site Selection
- Wind analysis & wind rose construction
- Determination of runway basic length & corrections
- Aircraft classification & Characteristics
- Components of airport system & Services
- Overall airport site , runway , taxiway , terminal bldg , parking lots
- Runways and holding aprons configurations
- Classification of airport soils ,
- Design of airport flexible and rigid pavement
- Railway Engineering , Definition , Components of railway systems , railway alignment , track elements
- Cross section , basic of design , railway platforms , length , switching , signaling

#### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roads and Parking lots by M.Y. Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R. Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.

**Course Code :** CB 758  
**Course Title :** Geographic Information System for Construction Engineering  
**Credit Hours :** 3

#### Course Description

Basics of GIS. Components of GIS. Spatial data. Attribute data. Types of attribute data. Data entry and tools. Themes generation. Building a system. Why GIS for some construction problems. Analytical functions. Overlay function. Buffering function. Search function. Techniques for analysis.

#### Course Objectives

The course aims at introducing the graduate student to the fundamental of the GIS , then the potential usages in the construction engineering , then various application in transportation, highway, geotechnical, environmental engineering.

#### Course Topics

- Basics and components of GIS
- Types of data entry and tools
- Sequence of building GIS system
- Analytical functions and how to use them
- General applications for construction engineering
- GIS for transportation engineering
- GIS for highway engineering
- GIS for geotechnical engineering
- GIS for environmental engineering

#### References

- Highway Engineering by C.H. Oglesby and R.G. Hicks Publisher: John Wiley & Sons, NY. Latest Edition
- Standard Handbook for Civil Engineers by F.S. Merrit Publisher: McGraw Hill book NY
- Pavement Management for Airports, Roadsand Parking lots by M.Y.Shahin Publisher: Chapman & Hall, New York Latest Edition.
- Egyptian Code for Highway by Ministry of Urban Planning Publisher: Latest Edition.
- Transportation and traffic Engineering Handbook by Institute of transportation Engineers Publisher: Prentice - Hall London ", Latest Edition.
- Handbook of Highway Engineering by R.Baker, van Nostrand Reinforced Co Publisher: New York, Latest Edition.



# Faculty Members

(in alphabetical order)

- **AHMED AWAD**  
Ph.D. (2006) Nottingham University, UK  
Construction Management
- **AHMED RAGHEB**  
Ph.D. (1994) Rensselaer Polytechnic Institute, USA  
Geotechnical Engineering
- **AKRAM SOLIMAN**  
Ph.D. (2003) Nottingham University, UK  
Coastal Engineering and Hydraulics
- **ALY I. EL-DARWISH**, Head of Department  
Ph.D. (1994) Michigan State University, USA  
Construction Materials and Reinforced Concrete Structures
- **EHAB EL-KASSAS**  
Ph.D. (2001) Dundee University, UK.  
Structural Engineering
- **HESHAM BASSIONI**  
Ph.D. (2004) Loughborough University, UK  
Construction Management
- **KARIM M. HELMY**  
Ph.D. (2007) University of Manitoba, Canada  
Structural Engineering
- **KHALED SHAWKI**  
Ph.D. (2002) Alexandria University, Egypt  
Construction Engineering
- **MOHAMED FODA**  
Ph.D. (1988) McGill University, Canada  
Transportation and Highway Engineering
- **MOHAMED IHAB EL-MASRY**  
Ph.D. (2004) University of Southern California, USA  
Structural Engineering
- **MOHAMED RASLAN**  
Ph.D. (1987) Southampton University, UK  
Structural Engineering and Metallic Structures
- **MORSY Alaa**  
Ph.D. (2009) Alexandria University, Egypt  
Structural Engineering

- **NABIL EL-ASHKAR**  
Ph.D. (2002) Georgia Institute of Technology, USA  
Construction Materials
- **NABIL ISMAIL**  
Ph.D. (1981) University of California, Berkeley, USA  
Coastal Engineering and Water Resources
- **TAREK M. ABDEL-AZIZ**  
Ph.D. (2007) Alexandria University, Egypt  
Geotechnical Engineering
- **USAMA ELSHAMY**  
Ph.D. (2005) Rensselaer Polytechnic Institute, USA  
Geotechnical Engineering.
- **WAEEL KAMEL**  
Ph.D. (1994) University of Paul Sabatier, France  
Environmental Engineering

## **General Rule for Graduation**

### For Graduation [M.Sc. in Construction & Building Engineering]

A student should complete (with satisfactory grades) a total of 8 courses (24 Credit Hours) and a thesis (12 Credit Hours) with a total of (36 Credit Hours).

A student can take into account a maximum of 7 courses (21 Credit Hours) from the same special division for the completion of the requirements of his graduation.

### For Graduation [M.Sc. in Construction & Building Engineering (special division)]

A student should complete at least 5 courses (15 Credit Hours) at the special division and a thesis (12 Credit Hours) at the same special division.

#### **Note:**

- Each student must have a supervisor by the end of the first term.
- An advising committee, assigned by the department council, will be acting as the academic advisor for the student until he chooses a supervisor.
- The student after consulting with his supervisor chooses the courses.