



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

**COLLEGE OF ENGINEERING
AND TECHNOLOGY**

(GRADUATE STUDIES)

Master of Science Programs

STATUS REPORT

ALEXANDRIA

2012

**CONSTRUCTION AND
BUILDING ENGINEERING**

M.Sc. PROGRAMS

M.Sc. in Construction and Building Engineering

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.

Program Detailed Structure

M.Sc. PROGRAM

(C) GEOTECHNICAL ENGINEERING

M.Sc. in Construction and Building Engineering

Program Structure

(C) Geotechnical Engineering

M.Sc. in Construction and Building Engineering

(C) Geotechnical Engineering

CORE COURSES:

Course Code	Course Title	Credit Hours
CB 730	Advanced Geotechnical Engineering	3
CB 731	Soil Stabilization Techniques	3
CB 732	Foundation on Problematic Soils	3
CB 733	Piling Engineering	3
CB 734	Special Geotechnical Structures	3
CB 735	Soil Dynamics and Earthquake Engineering	3
CB 736	Design and Construction of Diaphragm Walls and Slurry Walls	3
CB 737	Hydrogeology and Dewatering	3
CB 738	Reinforced Earth Structures	3
Subtotal	8 Courses * 3 Credit Hours	24

RESEARCH THESIS:

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

Total	36
--------------	-----------

Courses

DETAILED STRUCTURE

Course Code : CB 730

Course Title : Advanced Geotechnical Engineering

Credit Hours : 3

Course Description

Site improvement and soil stabilization techniques. Mechanically stabilized earth structures. Piles; types, and construction methods. Environmental Geotechnics: Site Characterization, Waste Containment Systems, Contaminant Transport, Remediation and Stabilization of Contaminated Ground.

Course Objectives

The course aims to develop an understanding of Planning a soil exploration program; Site improvement and soil stabilization techniques: Field testing; Slope stability analysis, stabilization methods and using geomembrane; Reinforced earth structure systems; Soil nailing design, construction and field evaluation.

Course Topics

- Planning an exploration program.
- Field tests: SPT, CPT, Dynamic CPT, DMT and Plate load test.
- Compaction, precompression, vibroflotation, vibro-replacement.
- Sand drains; Prefabricated Vertical Drains (PVDs) or wick drains.
- Analysis of slope stability.
- Methods for slope stabilization.
- Use of geomembranes for slope stability.
- Reinforced earth structures, methodology, design, monitoring and case histories.
- Soil nailing, theory, construction methods, monitoring and field evaluation test.

References

- Foundation Analysis and Design by J.E. Bowles, Publisher: McGraw-Hill, Latest edition.
- Geotechnical Engineering: Foundation Design by J.N. Cernica, Publisher: McGraw-Hill, New York, Latest Edition.
- Foundation Design and Construction by M.J. Tomlinson and R. Boorman, Publisher: Longman, Latest edition.
-
- Slope Stability and Stabilization Methods by Abramson, Lee, Sharma and Boyce, Publisher: Wiley, Latest edition.
-
- Geotechnical Practice for Waste Disposal by Daniel, D. E. ed., Publisher: McGraw-Hill, New York, Latest Edition.
-
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 10 Volumes, Al-Ahram Press, Latest Edition.
- ASCE , Geotechnical Engineering Journal.

Course Code : CB 731

Course Title : Soil Stabilization Techniques

Credit Hours : 3

Course Description

Art and science of soil stabilization; Soils with granular bearing skeleton; Modification and substitution of natural soil binder; Stabilization of cohesive soils; Stabilization for base and surface courses; Specific methods for soil stabilization; Soil compaction; Purpose of grouting: planning the grouting projects, Injectable soils; Control of grouts and grouting operations

Course Objectives

The course aims to expose the student to the state-of-art in soil stabilization as applied in large construction and transportation projects.

Course Topics

- Art and science of soil stabilization.
- Soils with granular bearing skeleton.
- Producing an artificial granular skeleton.
- Modification and substitution of natural soil binder.
- Stabilization of cohesive soils without granular skeleton
- Methods of stabilization for base and surface courses
- Specific methods for soil stabilization.
- Soil compaction; Compaction equipment; Control of compaction; Problems in compaction.
- Purpose of grouting: advantages and disadvantages, planning the grouting projects.
- Injectable soils and injection process; Control of grouts and grouting operations; Example of applications of injection.

References

- Slope Stability and Stabilization Methods by Abramson, Lee, Sharma and Boyce, Publisher: Wiley, Latest edition.
- Foundation Analysis and Design by BOWLES, J. E. Publisher: McGraw-Hill, New York, Latest Edition.
- Earth Reinforcement and Soil Structures by JONES, Colin, Publisher: Thomas Telford, London, Latest Edition.
- Foundation Engineering Handbook, H.F. Winterkorn and H.-Y.Fang Publisher: Van Nostrand Reinhold, Latest edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 10 Volumes, Al-Ahram Press, Latest Edition.
- ASCE , Geotechnical Engineering Journal.

Course Code : CB 732

Course Title : Foundation on Problematic Soils

Credit Hours : 3

Course Description

Types of problematic soils; Swelling soil; Types of swelling soils, Basic definitions and characteristics, Classification, Laboratory experiments, methods for foundations on swelling soils; Collapsible soils; Types, Field tests for collapsible soils, Laboratory experiments, Foundations on collapsible soils; Soft clay soils; Basic definitions; Field tests for soft clays; Laboratory experiments; Foundations on soft clays.

Course Objectives

The course aims at introducing the student to the types of problematic soils and the special considerations taken when constructing projects on each type.

Course Topics

- Problematic soils, Concept, scope and basic considerations.
- Soil types susceptible to expansion and collapse behavior.
- Field explorations; Surface and subsurface.
- Liquefaction phenomenon.
- Laboratory testing.
- Methodology of volume change prediction.
- Site design options.
- Design of foundation systems 1
- Design of foundation systems 2
- Minimization of foundations movement.
- Problematic soils mitigation measures.
- Construction techniques, inspection and monitoring.
- Moisture and vegetation control
- Foundation damages from expansive soils(Case history and mitigation measures)
- Remedial process

References

- Foundation Analysis and Design by BOWLES, J. E. Publisher: McGraw-Hill, New York, Latest Edition
- Principles of Foundation Engineering by DAS, Braja M., Publisher: Brooks-Cole, London, Latest Edition
- Geotechnical Engineering: Foundation Design by CERNICA, John N., Publisher: Wiley, Latest Edition
- Foundation Design and Construction by TOMLINSON, M. J. and Boorman R. Publisher: Longman, London, Latest Edition
- Principles of Geotechnical Engineering by DAS, Braja M., Publisher: Brooks-Cole, Latest Edition.
- Basic Soil Mechanics by WHITLOW Publisher: Longman, Latest Edition.
- Soil Mechanics: Principles and Practice by BARNES, G. E., Publisher: McMillan, London, Latest Edition.
- Soil Mechanics by CRAIG, R. F., Publisher: Chapman and Hall, Latest Edition.

(C) Geotechnical Engineering

- Advanced Soil Mechanics by DAS, Braja M. Publisher: Taylor & Francis, Washington, Latest Edition.
- Soil Mechanics Laboratory Manual by DAS, Braja M. Publisher: Engineering Press, Latest Edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 1st Edition, 10 Volumes, Al-Ahram Press, Latest Edition.
- Geotechnical Engineering: Soil Mechanics by CERNICA, John N., Publisher: Wiley, New York, Latest Edition.
- Experimental Soil Mechanics by BARDET, Jean-Pierre Publisher: Prentice Hall, New York, Latest Edition.
- ASCE, Geotechnical Engineering Journal

Course Code : CB 733

Course Title : Piling Engineering

Credit Hours : 3

Course Description

Site investigation for piling; Basic piling methods; Design of single piles; Design of pile groups; Design of piles subjected to lateral loads; Special considerations for design and construction of offshore piles; Tension leg platforms; Load distribution among group piles; Retaining walls; Problems in pile construction; Integrity testing; Pile testing; Pile dynamics; Choice of pile construction method and economics of design.

Course Objectives

To illustrate to the student the types of piled foundations and the advantages and limitations in construction and performance for each type.

Course Topics

- Site investigation for piling; Basic piling methods;
- Design of single piles; Design of pile groups;
- Design of piles subjected to lateral loads;
- Special considerations for design and construction of offshore piles;
- Tension leg platforms; Load distribution among group piles;
- Retaining walls;
- Problems in pile construction;
- Integrity testing; Pile testing; Pile dynamics;
- Choice of pile construction method and economics of design.

References

- Fleming, Weltman, Randolph and Elson, "*Piling Engineering*", Blackie, 1992
- H.G. Poulos and E.H. Davis, "*Pile Foundation Analysis and Design*", Wiley, 1980.
- M.J. Tomlinson and R. Boorman, "*Foundation Design and Construction*", 6th Ed., Longman, 1995

Course Code : CB 734

Course Title : Special Geotechnical Structures

Credit Hours : 3

Course Description

Cofferdams: Types; Single row sheet pile cofferdam; method of analysis; construction sequence; Geotechnical construction considerations; Double row sheet pile cofferdam; Construction sequence; Geotechnical construction considerations; Cellular cofferdams; Required data for cellular structure design and installation; design procedure; Field procedures and problems; Caissons: Types of caissons; Sinking and control; Carrying capacity of caisson as a foundation element.

Course Objectives

The course aims to introduce to the student types of special geotechnical structures implemented in large complex projects with emphasis on special considerations in the design and construction method of each type.

Course Topics

- Cofferdams: Types; Single row sheet pile cofferdam;
- method of analysis; construction sequence;
- Geotechnical construction considerations;
- Double row sheet pile cofferdam; Method of analysis;
- Construction sequence; Geotechnical construction considerations;
- Cellular cofferdams; Required data for cellular structure design and installation; design procedure;
- Field procedures and problems;
- Caissons: Types of caissons; Caisson design considerations; Sinking and control; Carrying capacity of caisson as a foundation element.

References

- Foundation Analysis and Design by J.E. Bowles, Publisher: McGraw-Hill, Latest edition.
- Foundation Design and Construction by M.J. Tomlinson and R. Boorman, Publisher: Longman, Latest edition.
-
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 10 Volumes, Al-Ahram Press, Latest Edition.
- ASCE , Geotechnical Engineering Journal.

Course Code : CB 735

Course Title : Soil Dynamics and Earthquake Engineering

Credit Hours : 3

Course Description

Vibration of elementary systems; Wave propagation in elastic, homogenous, isotropic media; Elastic waves in layered systems; Propagation of waves in saturated media, Behavior of dynamically loaded soils, Theories for vibrations of foundations on elastic media; Isolation of foundations, Instrumentation for measurements; Design procedures.

Course Objectives

To introduce the student to the basics of dynamic properties, behavior and effect of soil on foundations when subjected to vibrations. To illustrate to the student techniques to mitigate seismic effects on various geotechnical structures.

Course Topics

- Vibration of elementary systems.
- Wave propagation in elastic, homogenous, isotropic media.
- Elastic waves in layered systems.
- Propagation of waves in saturated media.
- Behavior of dynamically loaded soils.
- Theories for vibrations of foundations on elastic media.
- Isolation of foundations, Instrumentation for laboratory and field measurements.
- Design procedures for dynamically loaded foundations.
- Seismology and earthquakes.
- Strong ground motion.
- Seismic hazard analysis.
- Wave propagation; Dynamic soil properties.
- Ground response analysis; Liquefaction.
- Seismic Slope Stability Analysis.
- Seismic Design of Retaining Walls.

References

- Geotechnical Earthquake Engineering by S. Kramer, Publisher: Prentice.
- Vibrations of Soils and Foundations by F.E. Richart, J.R. Hall, and R.D. Woods, Publisher: Prentice Hall, Latest edition.
- Earthquake Engineering by R. Weigel, Publisher: Prentice Hall, Latest edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 10 Volumes, Al-Ahram Press, Latest Edition.
- ASCE , Geotechnical Engineering Journal.

Course Code : CB 736

Course Title : Design and Construction of Diaphragm and Slurry Walls

Credit Hours : 3

Course Description

General method of construction; Wall systems; Construction fundamentals; Load-bearing panels and foundation elements; Concrete technology and design; Design principles of wall-structure system; Underground transportation systems; Basic procedures for subway tunnels; Building and deep basements.

Course Objectives

The course aims at introducing the student to the fundamentals of selection, design and construction techniques of the various diaphragm and slurry wall types.

Course Topics

- Concept, History, Basic consideration.
- Case histories.
- Design aspects of diaphragms and slurry walls.
- Cantilever diaphragm wall
- Struted diaphragm wall
- Construction Aspects and sequence.
- Technical specification of slurry trench walls
- Two phase production of the Diaphragm wall and circuit of suspensions.
- Properties of supporting fluid and penetration of grains structure
- Reinforcing system and concreting devices.
- Applications of the diaphragm walls
- Construction of Diaphragm walls for basement excavation
- Environmental impact of diaphragm wall trenching
- Analysis of stability against collapse of open trench.
- Construction processes quality control and monitoring

References

- Foundation Analysis and Design by BOWLES, J. E. Publisher: McGraw-Hill, New York, Latest Edition.
- Geotechnical Engineering: Foundation Design by CERNICA, John N., Publisher: Wiley, Latest Edition.
- Earth Reinforcement and Soil Structures by JONES, Colin, Publisher: Thomas Telford, London, Latest Edition.
- Foundation Design and Construction by TOMLINSON, M. J. and Boorman R. Publisher: Longman, London, Latest Edition.
- Soil Mechanics by CRAIG, R. F., Publisher: Chapman and Hall, Latest Edition
-
- Basic Soil Mechanics by WHITLOW Publisher: Longman, Latest Edition.
- Soil Mechanics: Principles and Practice by BARNES, G. E., Publisher: McMillan, London, Latest Edition.

(C) Geotechnical Engineering

- Advanced Soil Mechanics by DAS, Braja M. Publisher: Taylor & Francis, Washington, Latest Edition.
- Soil Mechanics Laboratory Manual by DAS, Braja M. Publisher: Engineering Press, Latest Edition.
- Slope Stability and Stabilization Methods by ABRAMSON, Lee, Sharma and Boyce, Publisher: Wiley, New York, Latest Edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 1st Edition, 10 Volumes, Al-Ahram Press, Latest Edition.
- Geotechnical Engineering: Soil Mechanics by CERNICA, John N., Publisher: Wiley, New York, Latest Edition.
- Experimental Soil Mechanics by BARDET, Jean-Pierre Publisher: Prentice Hall, New York, Latest Edition.

Course Code : CB 737

Course Title : Hydrogeology and Dewatering

Credit Hours : 3

Course Description

Concepts and purpose of dewatering, Specifications of earth works and dewatering; investigations for soil and groundwater; groundwater hydrology; design of dewatering system, filter and drain design, dewatering system installation and dewatering project contract specification.

Course Objectives

The course aims at introducing the student to the fundamentals of soil hydrology as a basis for the design and construction of dewatering systems, contaminant barrier and soil improvements systems.

Course Topics

- Dewatering: Concepts, Purpose and basic consideration
- Investigations of geological conditions, soil, and Ground water.
- Permeability coefficient, lab. and field testing.
- Well hydraulics
- Interface among wells.
- Discharge from slot.
- Seepage; Principles, quantities and forces.
- Flow net construction
- Seepage control for foundations and earth dams.
- Design of dewatering systems.
- Permanent drainage after construction
- Filter and drain design
- Dewatering system installation, operation and maintenance and monitoring performance.
- Dewatering project contract specification.

References

- Principles of Geotechnical Engineering by DAS, Braja M., Publisher: Brooks-Cole, Latest Edition.
- Basic Soil Mechanics by WHITLOW Publisher: Longman, Latest Edition.
- Soil Mechanics: Principles and Practice by BARNES, G. E., Publisher: McMillan, London, Latest Edition.
- Soil Mechanics by CRAIG, R. F., Publisher: Chapman and Hall, Latest Edition.
- Advanced Soil Mechanics by DAS, Braja M. Publisher: Taylor & Francis, Washington, Latest Edition.
- Soil Mechanics Laboratory Manual by DAS, Braja M. Publisher: Engineering Press, Latest Edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 1st Edition, 10 Volumes, Al-Ahram Press, Latest Edition.
- Geotechnical Engineering: Soil Mechanics by CERNICA, John N., Publisher: Wiley, New York, Latest Edition.

(C) Geotechnical Engineering

- Experimental Soil Mechanics by BARDET, Jean-Pierre Publisher: Prentice Hall, New York, Latest Edition.
- ASCE, Geotechnical Engineering Journal

Course Code : CB 738

Course Title : Reinforced Earth Structures

Credit Hours : 3

Course Description

Introduction to soil-reinforcement concept, principles and properties; design of reinforced earth wall; internal and external stability analysis; steel strip reinforcement; cost estimate of RES; site investigation and tests, soil nailing design and procedures and specifications and contracting.

Course Objectives

The course aims at introducing the student to the fundamentals of Reinforced Earth Structures (RES) and Soil Nailed Structures (SNS); as basis for the design and construction, specifications, projects cost estimate and contracting.

Course Topics

- Soil Reinforcement concept, principles and properties.
- Design method of reinforced earth wall.
- Internal and external stability analysis.
- Steel strips reinforcement.
- Geo-synthetic reinforcement.
- RES cost estimate.
- RES specification and contracting documents.
- Soil nailing mechanics and description.
- Site investigation and testing
- Soil nailed wall design, nail head strength and stability considerations.
- Nails Corrosion protection and wall drainage.
- Soil nailing design procedures and Shotcrete facing.
- Performance monitoring.
- Specifications and contracting

References

- Principles of Geotechnical Engineering by DAS, Braja M., Publisher: Brooks-Cole, Latest Edition.
- Basic Soil Mechanics by WHITLOW Publisher: Longman, Latest Edition.
- Soil Mechanics: Principles and Practice by BARNES, G. E., Publisher: McMillan, London, Latest Edition.
- Soil Mechanics by CRAIG, R. F., Publisher: Chapman and Hall, Latest Edition.
- Advanced Soil Mechanics by DAS, Braja M. Publisher: Taylor & Francis, Washington, Latest Edition.
- Soil Mechanics Laboratory Manual by DAS, Braja M. Publisher: Engineering Press, Latest Edition.
- Design and Construction of Foundations, Egyptian Code for Soil Mechanics, Design and Construction of Foundations, 1st Edition, 10 Volumes, Al-Ahram Press, Latest Edition.
- Geotechnical Engineering: Soil Mechanics by CERNICA, John N., Publisher: Wiley, New York, Latest Edition.
- Experimental Soil Mechanics by BARDET, Jean-Pierre Publisher: Prentice Hall, New York, Latest Edition.

- ASCE, Geotechnical Engineering Journal

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.