جامعة الإمام عبدالرحمن بن فيصل
IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

Department of Building Engineering
College of Architecture and Planning

Master of Construction Engineering Management

2018

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IMAM ABDULRAHMAN BIN FAISAL UNIVERSITY

College of Architectural & Planning
Department of Building Engineering

Master of Construction Engineering Management "MCEM"

ماجستير إدارة هندسة التشييد

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Master of
Construction Engineering Management
"MCEM"

1 Principal Committee members

- Professor Mohamed Essam Shaawat (Chairman)
  Professor of Architectural Engineering and Construction Management
  Department of Building Engineering, College of Architecture and Planning
  Imam Abdulrahman Bin Faisal University
- Professor Abdul Salam Ali Al-Sudairi
  Dean, College of Architecture and Planning
  Professor of Architecture and Project Management
  Imam Abdulrahman Bin Faisal University
- Dr. Faris Abdullah Al-Maziad
  Chairman, Department of Building Engineering
  Assistant Professor, Building Energy Management
  Department of Building Engineering, College of Architecture and Planning
  Imam Abdulrahman Bin Faisal University
- Dr. Othman Subhi Al-Shamrani
  Dean, College of Engineering
  Associate Professor, Construction Management and Sustainable Buildings
  Imam Abdulrahman Bin Faisal University
- Dr. Ahmed Mohamed Eweda
  Assistant Professor, Construction Engineering and Management
  Department of Building Engineering, College of Architecture and Planning
  Imam Abdulrahman Bin Faisal University

2 International Program Reviewers

- Professor Tarek Hassan
  Professor of Construction Informatics and Associate Dean
  School of Architecture, Building, and Civil Engineering
  Loughborough University, United Kingdom
- Professor Karim Mohamed El-Dash
  Professor of Construction Engineering and Management
  Department of Civil Engineering, College of Engineering
  Banha University, Egypt

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3 Institution

3.1 University: Imam Abdulrahman Bin Faisal University

3.2 College: College of Architecture and Planning

3.3 Department: Department of Building Engineering

4 Program Title and Level

4.1 Program Degree

The graduate program offers the following graduate degree options:

- Master of Science in Construction Engineering Management (MSc)
- Master of Engineering in Construction Engineering Management (MEng)

4.2 Program Duration

The program requires each student to fulfill, a minimum two-year period and must complete all degree requirements within a maximum of 4 years' period.

4.3 Education System

The program is planned on the basis of a full-time or part-time (Department council approval is required) studies.

4.4 Style of Education

The program is offering an on campus style of education. Lectures are offered on campus for all required courses during the evening hours. A research thesis or capstone projects are also required for graduation based on the chosen program. College and University labs and other facilities such as the University Library, online resources, etc. are available for all students.

4.5 Thesis language

Students are able to develop the graduation master thesis or the capstone project in Arabic or English Languages

4.6 Expected number of Applicants to be admitted

It is expected to have about 15-20 applicants in the first year based on the market and previous studies conducted. This number will increase in the following years with the maximum capacity of 25 applicants per year.

5 Introduction

In the recent decades, the Kingdom of Saudi Arabia has witnessed rapid development and massive growth in the construction and building industry. This, evidently, has raised the need for development of the local Saudi expertise, the scientific and technical capabilities in the highly specialized and pertinent engineering areas of the construction industry. The holistic and comprehensive conception of the processes of building design, construction,

management and maintenance ensures efficient building design and operation with evident economic advantages.

The Construction Engineering Management program offers the scientific methods that can be applied to manage problems to find or choose optimal solutions, to exercise control and to assist in the decisions making during a construction project's life cycle

The program is designed to provide breadth in the managerial, technological, economic and environmental aspects of construction. The program is also designed to provide depth through systems approach encompassing construction management, estimation, planning and scheduling, project control, finance and economic analysis, business management, and green buildings. In this major, students will have the opportunity to focus on different topics of construction management including:

- Construction Project Management
- Cost Estimating, Financing, and Accounting, Building Economics
- Project Planning, Scheduling, and Control
- Construction Processes, Productivity, and Simulation of construction operations
- Project Contracting, Claims, Disputes, and Closure
- Information system and computer applications
- Value Engineering and Lean Construction
- Risk Management, bonds, and insurance
- Sustainability in the Built Environment
- Building Performance and Asset Management
- Advanced Building materials and systems
- Organization theory application for projects and enterprises
- Quality Management

6 Justification and Importance of the Program

The Master of Building Science program has been established in 1993. It hosts six different areas, one of which is Construction Management. Since its inception, forty-two Master holders have been graduated with theses. Among these, twenty-nine (70%) were in the field of Construction Management. In addition, currently twenty-one students are preparing their Master theses in the same field. On the other hand, a survey among the graduates has been conducted to seek their opinion about the areas to be separated as an independent program. In addition to a survey conducted among the construction stakeholders such as project managers, project engineers, construction site engineers, etc. The majority has opined for an individual master program in Construction Management, and to have a professional course-based program as an option of study. Accordingly, the Department of Building Engineering and the College of Architecture and Planning have found that there are strong reasons to offer an independent Construction Engineering Management graduate program based on the construction management area in the previous program. There are five common courses in this program and the previous one. The program is expected to fulfil the industrial needs with respect to construction engineering and management, by preparing master graduates who possess adequate knowledge and skills, and the required attributes of professionals and researchers in this field.

7 Paradigm

7.1 Community needs

The construction sector in KSA has been booming during the past decades. It has the greatest potential for the region's construction industry. Moreover, new technologies are enriching the construction industry in KSA which leads to an increasing necessity for skilled professionals that are capable to deal with such challenges. This program aims to fulfill a social national and regional need for specialists and researchers who are keen in enhancing their knowledge, skills, and abilities in the fields of Building Construction Management.

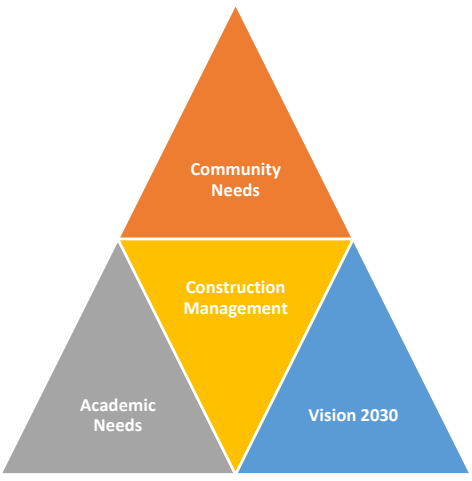
7.2 Vision 2030 – Building a Sustainable Future

Saudi Vision 2030 was unveiled by the Crown Prince Mohammad bin Salman bin Abdul-Aziz Al Saud, in April 2016. It proposes the kingdom's long-term strategy and aims to minimize the kingdom's reliance on oil as a revenue source and promote economic diversification. This economic shift will no doubt affect the construction industry requiring new expertise and technologies to accommodate the great demand on professionals in all phases of the construction. In addition to the ambitious goals of the vision for massive new constructions all over the kingdom, the concept of sustainability and resources management require the preparation of Saudi professionals who are aware and trained on the new concepts of sustainable construction practices and management. Sustainable construction aims to meet present needs for buildings and infrastructure without compromising the ability of future generations to meet their own needs in the future.

There are lots of new concepts and knowledge related to the sustainable construction such as the life cycle assessment, value engineering, waste management, energy management, sustainable construction management and field practices, Lean construction, asset and facilities management, etc.

7.3 Academic needs

In KSA, there is an increasing demand for more applied scientific researches in the field of Construction Management. It increases the level of cooperation among the University and public and private sectors through innovative applications and technologies. Buildings are getting more complex requiring scientists to apply scientific researches that integrate multiple professional disciplines for bringing construction projects to successful completion. The disciplines of



architecture, construction, and engineering need those who can skillfully use scientific methods, systematic reasoning, and apply quantitative or numerically based principles or computer applications to solve the difficulties in architecture, engineering, and construction management.

8 Program Vision

To be recognized as a national and regional leader in Construction Management education and research

9 Program MISSION

The mission of the Master in Construction Engineering Management Program at IAU is to serve the community by accomplishing the following:

- Provide graduates with both advanced knowledge and real work experience in order to prepare professionals to work in the construction industry and related domains in compliance with all sustainable practices.
- Conduct scientific research to participate in advancing the knowledge and keep the institution at the state-of-the-art of application.

10 Program Objectives

To accomplish the vision and mission of the program, the following objectives are formulated:

- Prepare graduates with advanced construction management education to meet the high demand of architects and engineers who are knowledgeable of various construction management tools and techniques
- Prepare graduates with abilities to manage various functions of complex construction projects to cope up with the requirements of contemporary complex projects
- Expose students to the latest and advanced technologies and their applications in the construction project management
- Enhance the decision-making processes by creativity, innovation, communication, and problem-solving skills
- Contribute to achieving the Kingdom's Vision 2030 by applying the main principles and understanding of sustainable development considering the social, economic and environmental aspects
- Engage students and faculty in scientific research programs that meet business, industry and community needs.

11 Program Learning Outcomes

Upon Successful completion of this program, the student will be able to:

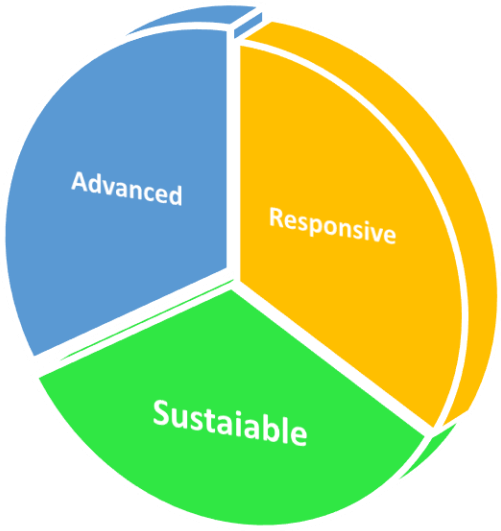
1. Understand a broad range of fundamentals and principles of construction management underpinning its practical application in the delivery of construction projects to meet the client's cost, time, aesthetic, functional and operational requirements.
2. Demonstrate a high level of technical understanding of building systems, and identify the associated construction processes and solutions.
3. Understand the construction projects stakeholders involved in design, construction and facilities management, their roles, responsibilities and interaction, and how to communicate with each other.
4. Recognize the diversity and a knowledge of contemporary professionals, and societal and global issues related to all areas of construction management.
5. Recognize the purpose and application of modern building codes in practice, contemporary and evolving technologies, and sustainable practices in the construction industry.
6. Identify the appropriate methods, tools and techniques required for data collection, analysis and interpretation, and generate innovative solutions related to construction management practices.
7. Design systems and processes necessary to manage construction projects through their life cycles.
8. Utilize various advanced information technology, numerical techniques and software packages to identify, analyze and solve real-world problems in construction projects.
9. Conduct sound researches in construction management by adopting systematic research methodologies and appropriate methods and techniques.
10. Demonstrate effective practices of managing, motivating and leading people who work in construction project teams.
11. Understand professional, moral, ethical and social responsibilities in all areas of construction management
12. Recognize the need for professional standards and demonstrate responsibility for life-long learning and professional growth.
13. Communicate ideas, concepts and solutions to both technical and non-technical audiences effectively, clearly and concisely using the most appropriate tools and forms of presentation.
14. Use computer skills, techniques and scientific tools necessary to access, evaluate technical information, summarize findings concisely, and communicate the findings both in writing and orally.

12 Why to study Construction Engineering & Management at IAU?

The Construction Engineering & Management graduate program at Imam Abdulrahman bin Faisal University (IAU) is distinguished in the Kingdom of Saudi Arabia in terms of the following attributes:

12.1 Advanced

This programme aims to prepare Professionals on the latest and most advanced topics in the area of construction management including advanced scheduling techniques, cost and time control, bidding models applied to the construction industry, risk, contingency and sensitivity analysis in construction, building asset management concepts and life cycle costing, etc. The program also exposes the students to the latest tools and techniques of modeling, planning and scheduling, and computer simulation and applications in all phases of building construction.



12.2 Contemporary and Responsive

This programme covers the skills that modern construction professionals need, and meet the construction industry challenges, specifically in Saudi Arabia. Students will be introduced to new and emerging technologies, and they will gain in-depth knowledge of construction industry management practices. The program is built to be responsive with the current challenges that face the Kingdom, such as the required rapid development, the climatic peculiarities and the current economic shifting.

12.3 Sustainable

The concept of Sustainability has become vital, important and essential. In Vision 2030, it is becoming the core of interest. It helps us meet today's needs with a good planning for the future generations.

Sustainable Construction does not only cover the traditional concepts of construction management, but it also involves issues related to management of buildings; modeling the performance of construction systems and materials; contemporary building techniques construction processes; efficiency of resources in buildings, operation and maintenance; forecasting the future conditions; long-term monitoring; adherence to ethical standards; occupational health and safety and working conditions; financing models; meeting the users level of services, etc.

13 Graduates Career Opportunities

Our graduates may have a wide spectrum of knowledge about Construction Engineering Management knowledge areas and will be able to work in many positions including:

- Project manager
- Project coordinator
- Cost engineer and Cost Estimator
- Site Engineer/Manager
- BIM coordinator/Manager
- Value Engineer
- Construction manager
- Project Planner
- Project Control Engineer/Manager
- Construction Risk Manager
- Quality Control/Assurance Engineer/Manager
- Procurement Engineer/Manager

14 Admission Requirements

Applicants are required to fulfill the University admission requirements which are:

- Applicants should either be citizens of Saudi Arabia or an official resident.
- Applicants should have a bachelor degree in architecture, building engineering, civil engineering, or related engineering disciplines from a Saudi university or any equivalent institution. (Applicants who do not meet this requirement, may have to take extra courses to cover areas of deficiency without graduate credit)
- Applicants must exhibit proper conduct, behavior and be medically fit.
- Applicants must provide two recommendation letters.
- If the applicant is employed, he must provide an approval from his employer.
- A Bachelor's degree with GPA of not less than 3.25/5.0 or equivalent.
- Pass the English language requirement with a minimum score of 60 "*iBT*" or equivalent.
- Applicants could be awarded an official postgraduate scholarship based on the University regulations.

15 Program Structure

- The Master of Construction Engineering Management at College of Architecture and Planning – Building Engineering department is intended for those who already hold a degree in architecture, building engineering, civil engineering, or related engineering disciplines.
- The Master of Construction Engineering Management offers two graduate degree options; Master of Science in Construction Engineering Management (MSc), Master of Engineering in Construction Engineering Management (MEng). In both options, students must complete certain courses (Core and Electives) and a capstone project/or thesis with a total of 30 credit hours.
- In MSc option, the thesis gets more weight in terms of credit hours (6 credit hrs) as opposed to the capstone project (3 credit hrs) in MEng option where contribution and originality are essential in the thesis.

- The five core courses introduce all students to fundamentals and principles of the project management, planning, scheduling, economics of construction projects, and statistics and decision making, in addition to a course on research methods and technical writing.
- The program offers a wide range of elective courses covering different topics of construction engineering management. Students in the MSc option should complete three elective courses and a 6-credit hours of research thesis. Students in the MEng option are required to complete four elective courses, and a 3-credit capstone project is required to graduate.

15.1 Program required credit hours

15.1.1 Master of Science (MSc - Research)

The 30 credit hours required for graduation are;

- 15 Credit hours of core courses
- 9 Credit hours of elective courses
- 6 Credit hours of master thesis

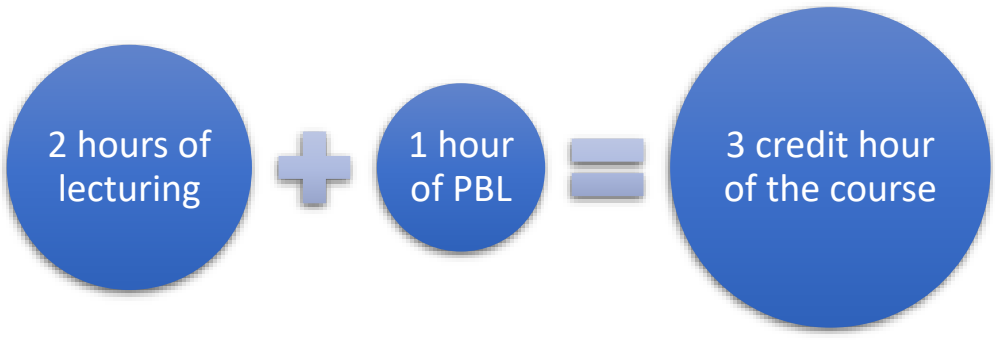
15.1.2 Master of Engineering (MEng - Capstone Project)

The 30 credit hours required for graduation are;

- 15 Credit hours of core courses
- 12 Credit hours of elective courses
- 3 Credit hours of capstone project

16 Project Based Learning (PBL)

The program focuses on the new methods of learning that engage students in an ongoing learning experience by encouraging them to solve real (local or global) problems. This requires critical thinking, finding solution based on evidence from research, collaboration between students in team work, and communicating their solutions using multimedia. Hence, the three credit hours for each of the offered courses will be divided into 2 hours lecturing and 1 hour of project based learning. This will help students to apply the principals covered during lectures in real projects.



17 DEGREE REQUIRMENTS

The candidate for the Master's Degree in Construction Engineering Management must meet the following requirements:

a. Satisfactory completion of thirty (30) credit hours of courses and thesis research in MSc option, or courses and capstone project in the MEng option according to the study plan that has been approved by his Academic Advisor and the Departmental Postgraduate Committee.
b. Satisfactory complete and defend a thesis in the field
c. Attain a cumulative Grade Point Average (G.P.A) of not less than 3.75 out of 5.0

17.1 Master of Science Degree - thesis option.

Student who chooses this option will be assigned an advising committee where one of the members will be a principle advisor. Students will develop an Academic Program of Study with their supervisor and present a Thesis Proposal. They will complete all required course work, research and write the thesis. To graduate, they will defend the thesis in an oral examination. Students must register for 6 credits of MCEM 690 Master's Thesis Research in addition to 24 course credits for a total of 30 credit.

Master of Science Plan (MSc - Research)

First Semester

Code	Course Title	Cr. hr.
MCEM 601	CONSTRUCTION PROJECT DELIVERY AND MANAGEMENT	3
MCEM 602	ENGINEERING ECONOMY, ACCOUNTING AND FINANCIAL MANAGEMENT	3
MCEM 603	BUILDING INFORMATION MODELING IN CONSTRUCTION	3
Total		**9**

Second Semester

Code	Course Title	Cr. hr.
MCEM 604	ADVANCED PLANNING & CONTROL TECHNIQUES	3
MCEM 605	ADVANCED RESEARCH METHODS AND TECHNICALWRITING	3
MCEM 6XX	MCEM Elective Course	3
Total		**9**

Third Semester

Code	Course Title	Cr. hr.
MCEM 6XX	MCEM Elective Course	3
MCEM 6XX	MCEM Elective Course	3
MCEM 690	Master Thesis	6
Total		**12**

Fourth Semester

Code	Title	Cr. hr.
MCEM 690	Master Thesis (continued)	
Program Total Cr. hrs.		**30**

17.2 Master of Engineering Degree – Capstone Project option.

Student who chooses this option will be guided to develop a study plan by the program director. This option requires the completion of 27 credits for courses, and in order to graduate, the student must select a Faculty in the field to act as his advisor in the 3 credits of MCEM 680 Graduation Capstone Project for a total of 30 credits.

Master of Engineering Plan (MEng - Capstone Project)

First Semester

Code	Course Title	Cr. hr.
MCEM 601	CONSTRUCTION PROJECT DELIVERY AND MANAGEMENT	3
MCEM 602	ENGINEERING ECONOMY, ACCOUNTING AND FINANCIAL MANAGEMENT	3
MCEM 603	BUILDING INFORMATION MODELING IN CONSTRUCTION	3
Total		9

Second Semester

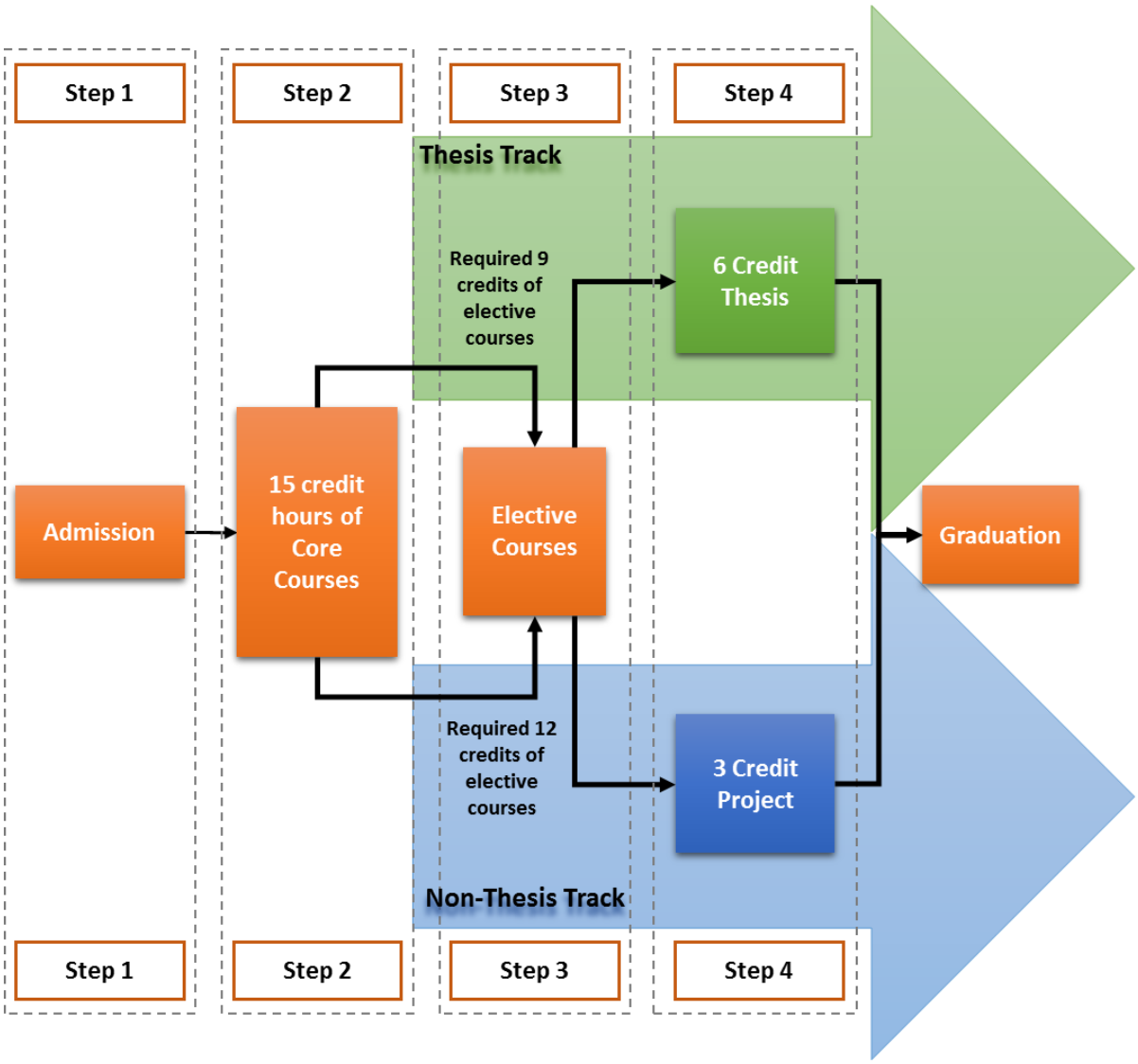
Code	Course Title	Cr. hr.
MCEM 604	ADVANCED PLANNING & CONTROL TECHNIQUES	3
MCEM 605	ADVANCED RESEARCH METHODS AND TECHNICALWRITING	3
MCEM 6XX	MCEM Elective Course	3
Total		9

Third Semester

Code	Course Title	Cr. hr.
MCEM 6XX	MCEM Elective Course	3
MCEM 6XX	MCEM Elective Course	3
MCEM 6XX	MCEM Elective Course	3
Total		9

Fourth Semester

Code	Course Title	Cr. hr.
MCEM 680	Capstone Project	3
Program Total Cr. hrs.		30



18 Offered Courses

The program offers a wide range of graduate courses that cover all the program goals and objectives. The courses are meant to fulfil the three main program attributes.

18.1 Core Courses (15 credit hours' mandatory)

Code	Core Courses	Cr.hr.
MCEM 601	Construction Project Delivery and Management	3
MCEM 602	Engineering Economy, Accounting And Financial Management	3
MCEM 603	Building Information Modeling In Construction	3
MCEM 604	Advanced Planning and Control Techniques	3
MCEM 605	Advanced Research Methods and Technical writing	3

18.2 Elective Courses

Code	Elective Courses	Cr.hr.
MCEM 606	Construction Cost Estimating	3
MCEM 607	Value Engineering	3
MCEM 608	Sustainable Construction Management and Field Practices	3
MCEM 609	Construction Contracting, Bonds, & Insurance	3
MCEM 610	Advanced Construction Processes and Equipment Management	3
MCEM 611	Simulation and Design of Construction Operation	3
MCEM 612	Life Cycle Costing	3
MCEM 613	Project Risk Management	3
MCEM 614	Applied Statistics and Decision Analysis	3
MCEM 615	Building Asset Management	3
MCEM 616	Building Operation and Maintenance	3
MCEM 617	Building Energy Management	3
MCEM 618	Building Performance Criteria and Evaluation	3
MCEM 619	Building Services and Operation	3
MCEM 620	Lean Construction and Resource Management	3
MCEM 621	Computer Applications in Construction Management	3
MCEM 622	Green Building Design and Practices	3
MCEM 623	Advanced Construction Materials	3
MCEM 650	Special Topics in Construction Management	3

18.3 Graduation Thesis and Project

Code	Course		Cr. hr.
MCEM 680	Capstone Project	(MEng option)	3
MCEM 690	Master Thesis	(MSc option)	6

19 Facilities and capabilities

The Department of Building Engineering is adequately staffed regarding faculty, lecturers, demonstrators and technicians. A wide range of equipment suitable for research is available in the department and on campus.

19.1 Available Facilities:

The Building Engineering department provides a variety of facilities available to its students and faculty, including lecture halls, laboratories, and libraries,

Lecture halls

The College of Architecture & Planning has many lecture halls and classrooms with different capacities in addition to the main auditorium hall.

Figure 1. The main lecture hall

Figure 2. Special classroom for graduate students.

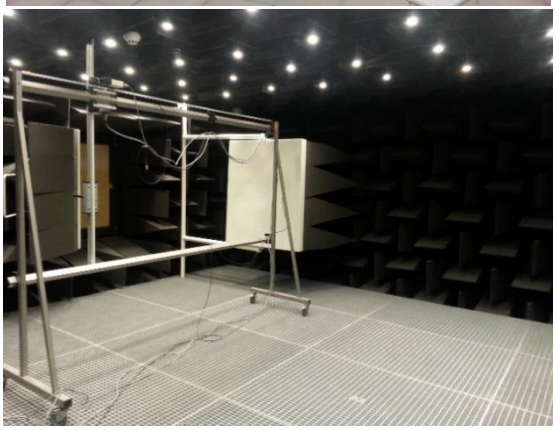
Laboratories

The college has several well established labs, where they provide an excellent scientific environment for the graduate student to conduct their studies. These labs include; acoustic lab, lighting lab, thermal lab, building material lab, geotechnical lab, survey lab, modeling lab, and computer labs.

Figure 3. The material lab

Figure 4. Thermal Lab

Figure 5. Solar monitoring station at the roof top of the College of Architecture & Planning



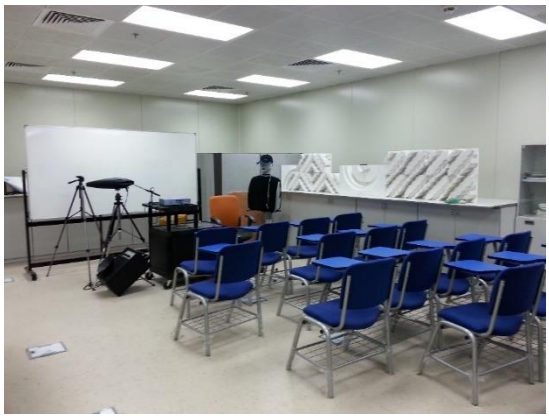


Figure 6. Acoustic Lab

Figure 7. Modeling lab

Library and scientific databases:

State of the art library equipped with books, Journals and electronic media is available for the students on campus

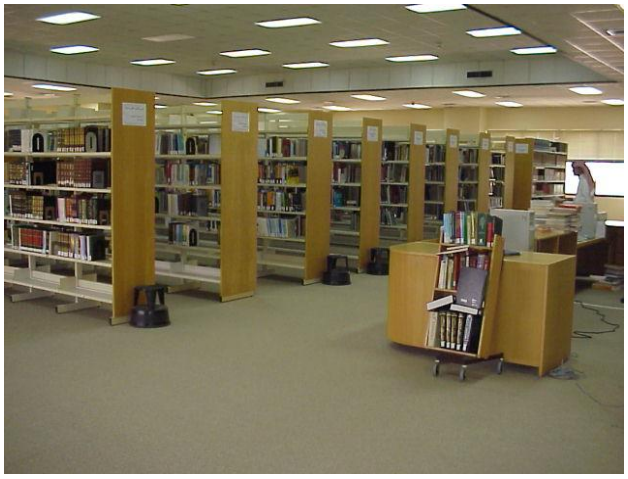


Figure 8. The general library of the university

Computer labs:

The college has five computer labs, which equipped with software packages related to Building Engineering and Construction Management. That can be used by the postgraduate student

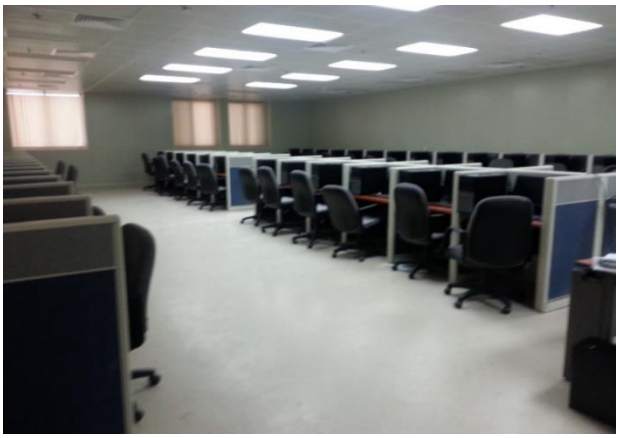


Figure 9. One of the main computers labs in the college.

Construction Site Training/Visits

Students will be able to visit construction sites and have on-site training during their studies in the Master program. The training will be available by collaboration with the Community Service & Sustainable Development Unit.

19.2 Faculty Members

#	Name	Academic Rank	Area of Interest
Construction Management Faculty	Abdul Salam Ali Al-Sudairi	Professor Dean – College of Architecture and Planning.	Project Management and Lean Construction
	Faris Abdullah Almaziad	Assistant Professor Department Chair	Building Energy Management
	M. Essam Shaawat	Professor Director of Dept. Graduate Studies	Architecture and Construction Management
	Othman Al Shamrani	Associate Professor Dean- college of Engineering	Construction Management and Sustainable Buildings
	Altayeb Qasem	Assistant Professor	Civil Engineering and Construction Management
	Ahmed Eweda	Assistant Professor	Construction Management – Asset Management
	Abdul Aziz Saud Al-Mohasin	Assistant Professor	Building Engineering – risk management
	Khaled Saakr	Assistant Professor	Civil Engineering – Construction management
Supporting Disciplines	Yaseen Sallam	Professor	Construction Materials Technology
	Hany Elsayed	Associate Professor	Building Services and Acoustics
	Emhaidy Gharaibah	Associate Professor	Structural Engineering and Modeling
	Ali Algarni	Assistant Professor	Construction Engineering and Building Services
	Faris Al Fariday	Assistant Professor	Construction Engineering
	Abdul Mujeebu	Associate Professor	Building Energy Management
Lecturers	Mohamed Fouad	Lecturer	Civil Engineering - Construction Management
	Abdullah Alyami	Lecturer	Architecture- Construction Project Management
	Abdullah Alkhtany	Lecturer	Building Engineering - building management
	Musaad Alhawas	Lecturer	Energy Conservation And Design
	Fahad Bin M. Al-Yami	Lecturer	Building Engineering – Building Services
	Mohammed Bin S. Al-Mulhim	Lecturer	Building Engineering – Structure engineering
	Salah Al-Ghamdi	Lecturer	Building Engineering – Building services
	Ashraf Noman	Lecturer	Mechanical Engineering - Energy management
	Rehan Jamel	Lecturer	Civil engineering – Building Services
	Eshaq Abdulrazik Alhashimi	Lecturer	Building Engineering – Construction Management
	Meqdad Hassan	Lecturer	Electrical engineering – Building Services

20 Learning Outcomes Accreditations Mapping

#	Program Students Learning Outcomes	Accreditations Mapping	
		NCAA	ABET Criteria
1	Understand a broad range of fundamentals and principles of construction management underpinning its practical application in the delivery of construction projects to meet the client's cost, time, aesthetic, functional and operational requirements.	Knowledge	a- An ability to apply knowledge of mathematics, science, and engineering.
2	Demonstrate a high level of technical understanding of building systems, and identify the associated construction processes and solutions.		a- An ability to apply knowledge of mathematics, science, and engineering.
3	Understand the construction projects stakeholders involved in design, construction and facilities management, their roles, responsibilities and interaction, and how to communicate with each other.		d- An ability to function on multidisciplinary teams.
4	Recognize the diversity and a knowledge of contemporary professionals, and societal and global issues related to all areas of construction management.		h- The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context.
5	Recognize the purpose and application of modern building codes in practice, contemporary and evolving technologies, and sustainable practices in the construction industry.		j- A knowledge of contemporary issues.
6	Identify the appropriate methods, tools and techniques required for data collection, analysis and interpretation, and generate innovative solutions related to construction management practices.	Cognitive Skills	b- An ability to design and conduct experiments as well as to analyze and interpret data
7	Design systems and processes necessary to manage construction projects through their life cycles.		c- An ability to design a system, component, or process to meet the desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
8	Utilize various advanced information technology, numerical techniques and software packages to identify, analyze and solve real-world problems in construction projects.		e- An ability to identify, formulate, and solve engineering problems.
9	Conduct sound researches in construction management by adopting systematic research methodologies and appropriate methods and techniques.		l- Conduct Sound research in Engineering

10	Demonstrate effective practices of managing, motivating and leading people who work in construction project teams.	Interpersonal Skills &	d- An ability to function on multidisciplinary teams.
11	Understand professional, moral, ethical and social responsibilities in all areas of construction management		f- An understanding of professional and ethical responsibility.
12	Recognize the need for professional standards and demonstrate responsibility for life-long learning and professional growth.		i- A recognition of the need for, and the ability to engage in life-long learning.
13	Communicate ideas, concepts and solutions to both technical and non-technical audiences effectively, clearly and concisely using the most appropriate tools and forms of presentation.	Communication skills	g-An ability to communicate effectively.
14	Use computer skills, techniques and scientific tools necessary to access, evaluate technical information, summarize findings concisely, and communicate the findings both in writing and orally.		k- An ability to use the techniques, skills and modern engineering tools necessary for engineering practice.

21 Courses Specifications

Course:

Course Title: CONSTRUCTION PROJECT DELIVERY AND MANAGEMENT (Core course)
Course Number and Code: MCEM 601
Course Pre-requisites:
Course Hours: 3h/week

Course Description:

This course provides an over view of construction project management. The first part reflects on how the established set of project management knowledge areas applies to all phases of building projects' life cycle. It introduces the use of modern management techniques to achieve the project objectives in terms of the scope, cost, time, and quality. The second part focuses on the project team, organizational and behavioral aspects; the project manager; the management of project resources; project success evaluation techniques; management information and decision support systems. In addition, the key attributes and applications of Project Delivery Systems (PDS); design-bid-build, Construction Management, Build-Operate-Transfer (BOT), and Design-Build. With some brief discussion on job order contracting, IPD (integrated project delivery), and public-private partnerships (PPP).

Course Objectives:

- Develop a thorough understanding of all key competency areas in project & construction management.
- Understanding the range of knowledge areas in project and project management;
- Develop skills and training on professional planning scheduling techniques
- Provide the roles of procurement and contracting methods in project success, strengths and weaknesses Project Delivery System.
- Illustrate characteristics of project organizations and project management teams those providing assistance to owners

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Understand the basic theories of management and construction management;
- Appreciate the role of various design and construction professionals;
- Demonstrate a general knowledge of site management procedures for efficient and effective use resource management in construction sites;
- Identify factors affecting the selection of the project procurement systems;
- Define the significant attributes of major project delivery systems;
- Identify the factors to be considered for choosing the appropriate PDS for each project.

Course Evaluation (grades):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Buchheit, P., 2017. *Disposable Americans: Extreme Capitalism and the Case for a Guaranteed Income*. Taylor & Francis.
- Kerzner, H., 2013. *Project management: a systems approach to planning, scheduling, and controlling*. John Wiley & Sons.

Course:

Course Title: ENGINEERING ECONOMY, ACCOUNTING AND FINANCIAL MANAGEMENT (Core course)

Course Number and Code: MCEM 602

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This course focuses on the economic analysis and its role in engineering decision making, accounting techniques, and financial management. It introduces the cost concepts, economic environment, time value of money, accounting, and financing. It covers topics related to the feasibility analysis of projects, economic comparison of alternatives, evaluation of projects in the private and public sectors, effect of inflation, deflation, introducing the concepts of life cycle cost, financial methods, and financial statements and their use in developing company budgets with emphasis on the cash flow analysis. The course also aims to enhance the written and oral communication skills necessary, open group discussions, and team work.

Course Objective:

- Discuss the principals of Economic analysis, Financial Management and associated accounting and financial methods for decision making
- Prepare graduates to estimate cost items of the project life cycle and develop the cash flow.
- Prepare graduates to develop financial statement for private and public sectors in the construction industry.
- Develop skills necessary to effectively analyze project cost of different alternatives and apply the appropriate engineering economic analysis method(s) for decision making.
- Develop skills necessary to effectively analyze financial statements, capital investments, and prepare operating budgets.
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completing of this course, students will be able to:

- Recognize the theories and applications of engineering economics principals and methods for decision making.
- Recognize the concepts of financial management, construction organization budgets, and cash flow analysis.
- Utilize economic and financing principals to analyze projects, select best alternative(s), and develop financial statements and operating budgets.
- Participate in team-works in a harmonized manner for the solution of the problem.
- Write technical report and carry out presentations for engineering economics project.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- White, J. A., Case, K. E., & Pratt, D. B, 2012. *Principles of engineering economic analysis*. Wiley, 6th edition.
- Chan, S. P.,2015. *Contemporary Engineering Economics*. Pearson; 6th edition

Course:

Course Title: BUILDING INFORMATION MODELING IN CONSTRUCTION (Core course)

Course Number and Code: MCEM 603

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

The Architecture, Engineering, and Construction (AEC) industry is undertaking a significant transformation due to the emergence of the concept of Building Information Modeling (BIM) and other digital technologies. Construction professionals now design, analyze and construct in a virtual environment prior to starting the construction itself. This course introduces the concept of BIM technologies and its implementation at different projects stages; pre-construction, construction, and Facility Management (FM). The course also covers how to employ it for analytical process such as visualization, quantity takeoff, cost estimating, scheduling, process monitoring, and coordination; in addition to studying its impact on the Construction Management (CM) functions conducting constructability analysis, and clash/conflict detection. The course also covers current technologies used in the BIM process, including tools such as Autodesk Revit Architecture and gaining knowledge to work with architectural, structural, mechanical, electrical and plumbing models. Graduates will also develop an understanding of 4D simulation of the planned construction process, visualization and animation. A project is required.

Course Objective:

- Discuss the concept of BIM and its implementation at different stages of construction project.
- Discuss the role and impact of BIM on different CM functions
- Prepare graduates to utilize latest technologies used in the BIM process and simulation
- Prepare graduates to work collaboratively in a multi-disciplinary team during construction.
- Prepare graduates to utilize BIM as an implementation and execution plan during construction
- Encourage class open discussion, group discussions, technical project development, and team work.

Course Learning Outcomes:

After completing this course, graduates will be able to:

- Identify and categorize the principles of Building Information Modelling
- Recognize the role and effect of BIM in the construction industry from design to FM
- Utilize BIM and 4D simulation technologies and perform CM related analysis
- Prepare a BIM project implementation and execution plans
- Apply BIM software tools to simulate the design, construction, and operation processes.
- Participate in team-works in a harmonized manner for the solution of the targeted problem.
- Carry out presentations using multimedia for the BIM project models and analysis.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Eastman, C.M., Eastman, C., Teicholz, P. and Sacks, R., 2011. *BIM handbook: A guide to building information modeling for owners, managers, designers, engineers and contractors*. John Wiley & Sons.

Course:

Course Title: ADVANCED PLANNING & CONTROL TECHNIQUES (Core course)
Course Number and Code: MCEM 604
Course Pre-requisites: MCEM 601
Course Hours: 3h/week

Course Description:

This course provides students with knowledge of planning and advanced control techniques that help the engineer in understanding and solution identification of complex planning, monitoring, and control problems in the construction industry. Examine the elements of critical path planning and scheduling methods using: network diagrams; bar charts; time, resources and cost relationships; resource leveling; cash flow; monitoring and updating of project schedules; group planning techniques; an introduction to risk analysis in scheduling, procurement and engineering schedules interaction; and an introduction to computer applications. Hands-on activities and exercises illustrate practical construction considerations

Course Objectives:

- To learn the use and application of advanced tools to the planning, monitoring, and control of construction projects.
- Provide a comprehensive understanding of the fundamentals of project planning, monitoring and control a construction project using CPM (Critical Path Method) and its associated techniques.
- Provide the basic knowledge and developing expertise in dealing with construction problems such as uncertainty and modeling repetitive construction work.
- Provide students with the understanding and application of the tools and techniques necessary for construction managers.

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to:

- Understand and equipped with skills relevant for planning and scheduling of their construction projects.
- Understand of roles and advanced techniques for a project manager to effectively manage projects
- Implement the appropriate scheduling technique(s) and apply it/them to a given situation
- Apply project management principles to complete projects with desired results.
- Implement the common methods, tools, and techniques for controlling and simulating construction process in projects.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Sears, Sears, Clough, Rounds & Segner, 2015. Construction Project Management, published by John Wiley and Sons Inc., 6th edition, USA.
- Cooke and Williams, 2013. Construction Planning, Programming and Control, Wiley Blackwell, 5th edition.
- Harris, 2013. Project Planning and Control Using Primavera P6 Versions

Course:

Course Title: ADVANCED RESEARCH METHODS AND TECHNICAL WRITING (Core course)
Course Number and Code: MCEM 605
Course Pre-requisites:
Course Hours: 3h/week

Course Description:

This course covers research methods and writing skills. The first part is research methods that covers topics such as searching and processing the literature, identifying a research problem, problem formulation, research ethics, research questions & objectives, types of research, designing methodology, digital tools, methods and tools of data collection & analysis using statistical methods and tools, interpretation of data and drawing conclusions. The technical writing part focuses on effective written and oral communication of the research: citation and referencing, writing tips, writing a research proposal, thesis structure and its preparation, writing a manuscript for publication and oral presentation skills.

Course Objectives:

- To teach the basic concept of scientific research, types of research, searching and processing the literature to identify a problem for research, and defining the research questions and objectives
- To teach and train how to develop the theoretical framework and methodology for research, various methods and tools of data collection and analysis, and how to interpret the results and draw conclusions.
- To teach basic structure of thesis and manuscript for publication, and to train how to prepare them; to teach various writing tips, ethics of documentation and oral presentation skills.

Course Learning Outcomes:

Upon successful completion of the course, the students will be able to:

- Identify, Define and formulate the research problem, research hypothesis, research questions and objectives
- Develop the theoretical framework and methodology for the research and prepare the research proposal
- Conduct the research independently, collect and analyze the data, interpret the results and draw meaningful conclusions
- Write thesis in English by themselves by following the standard format and ethics, and write a manuscript for publication

Course Evaluation (grads):

Weekly performance: 10%	
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Kothari, C.R., 2004. *Research methodology: Methods and techniques*. New Age International.
- Groat, L.N. and Wang, D., 2013. *Architectural research methods*. John Wiley & Sons.
- Shelton, J.H., 1994. *Handbook for technical writing*. Chicago: NTC Business

Course:

Course Title: Construction Cost Estimating

Course Number and Code: MCEM 606

Course Pre-requisites: MCEM 602

Course Hours: 3h/week

Course Description:

This course covers the theories, concepts, procedures, and practices required to develop construction projects estimates. It seeks and in-depth understanding of the cost estimating process, covering the various project areas that must be estimated. Several estimating classifications for different purposes will also be introduced. It covers topics related to quantity takeoffs, estimating cost, productivity and labor hours, material and equipment, profit and overheads, subcontract pricing, and contingencies in estimating. Furthermore, this course seeks to define the estimate's role in project delivery and administration including bidding processes and cost control. In this course, graduates will be introduced to the computer aided estimating for construction cost, budget, and elemental costing. The course also aims to enhance the written and oral communication skills necessary, open group discussions, and team work. A project is required.

Course Objective:

- Discuss the role of estimating in the construction industry.
- Discuss the bid procedures, controls and strategy
- Prepare graduates to analyze construction documents and perform quantity takeoff.
- Prepare graduates to apply pricing data to takeoff quantities.
- Utilize computer aided estimating software packages
- Analyze and synthesize the information required to develop a complete cost estimate package for projects
- Analyze and discuss construction ethics relating to the estimating process.

Course Learning Outcomes:

Upon successful completion of the course, students will be able to:

- Understand the significance of estimating to the construction industry and its risks.
- Recognize different types of estimates and their purposes and uses.
- Analyze and interpret construction drawings and specifications.
- Perform detailed quantity takeoffs and estimates based on specifications and drawing standards.
- Use computer software for quantity takeoffs and cost estimations.
- Prepare a complete cost estimate package for projects
- Write technical report and carry out presentations for cost estimation project

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Peterson, S.J., 2012. *Construction estimating using Excel*. Pearson Prentice Hall.
- Brook, M., 2016. *Estimating and tendering for construction work*. Taylor & Francis.
- Ostwald, P.F., 2003. *Cost analysis and estimating for engineering and management*. Prentice Hall.

Course:

Course Title: VALUE ENGINEERING

Course Number and Code: MCEM 607

Course Pre-requisites: MCEM 602

Course Hours: 3h/week

Course Description:

This course introduces the students to the concept of value in Engineering (VE). VE is an organized approach to provide the necessary functions at the lowest costs. This course provides students with knowledge and techniques of working in a multi-disciplinary team to produce outcomes which demonstrate good value in programs, projects, systems, services or products. Classical VE principles will be introduced and practical applications for construction managers, contractors, and other construction functions will be described. This course is designed to offer the students a chance to work in an industry participation on a real-world-problem. Several concepts required to conduct value engineering in the construction industry is introduced including, Function Analysis System Technique, Idea Generation Techniques, Multi-Attribute Evaluation, Life Cycle Costing, etc. It also aims to equip students with the skills required to develop alternatives, life cycle cost assessment, prepare presentations of their findings as well as a written report. A project is required.

Course Objective:

- Discuss the theories and applications of Value Engineering (VE), Value Management (VM) and Value Analysis (VA) in different phases of projects.
- Discuss all concepts required to conduct value engineering in the construction industry.
- Prepare graduates to develop VE analysis using the classical VE job plan.
- Prepare graduates to synthesize all information and analysis in order to develop a complete VE report and present findings
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon Successful completion of this course, students will be able to:

- Comprehend all the theories and applications of the VE/VM/VA in the construction industry.
- Recognize the VE process, principals and techniques.
- Recognize the role and responsibility of the multi-disciplinary team and inputs from different stakeholders.
- Analyze functions of a project, allocate cost and worth to functions, and generate creative ideas.
- Apply VE problem solving techniques and associated Life cycle cost analysis as management tools.
- Participate in team-works in a harmonized manner for the solution of the targeted problem.
- Write technical report and carry out presentations on a value engineering report.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Dell'Isola, A., 1997. *Value Engineering: Practical Applications... for Design, Construction, Maintenance and Operations* (Vol. 35). RSMeans.
- Al-Yousefi, A., 2007 *Value Management Concept &Techniques*, Fifth Edition, SAVE International.

Course Title:

Course Title: SUSTAINABLE CONSTRUCTION MANAGEMENT AND FIELD PRACTICE
Course Number and Code: MCEM 608
Course Pre-requisites: MCEM 601
Course Hours:3h/week

Course Description:

This course provides sufficient knowledge to students about green management and operations of construction sites from pre-construction stage to close -out, post construction and commissioning stage. This course will cover management methods in construction; waste management, water management, energy management, environmental impact, Life Cycle Assessment, sustainability vocabulary in subcontracts, methods of improving workers' safety and health in construction sites, sustainable rating systems (LEED - BREEAM...etc.), development and execution of proper commissioning, and preparing commissioning and close-out documents for sustainable buildings operations and Green certifications.

Course Objective:

- Understand the scope of sustainable construction management
- Be able to articulate best practices for field operations
- Learn & measure the environmental impact of construction sites
- Knowledge of Green certification documentation such as LEED & BREEAM

Course Learning Outcomes:

Upon successful completion this course, students will be able to;

- Recognize the scope of sustainable construction management
- Understand the sustainable rating systems requirement in construction sites
- Measure the environmental impact of construction project overall life span.
- Articulate best practice for field operations
- Recognize the all criteria which effect of sustainable of construction sites

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Kibert, C. J., 2016. *Sustainable construction: green building design and delivery*. John Wiley & Sons.
- Sarté, S. B., 2010. *Sustainable infrastructure: the guide to green engineering and design*. John Wiley & Sons.

Course:

Course Title: Construction Contracting, Bonds, & Insurance

Course Number and Code: MCEM 609

Course Pre-requisites: MCEM 604

Course Hours: 3h/week

Course Description:

This course focuses on the basics and legalities of project contracts. It also covers the different types of contracts for different Project Delivery Methods. Graduates will be introduced to the contracting procedures, bidding and project awarding procedures, national and international labor and procurement regulations, international and general contracting clauses, change orders procedures, dispute resolutions methods, schedule delay analysis, claim analysis, and construction contract quality management. The course also introduces graduates to project financing schemes including risk mitigation, construction insurance and construction bonds. Graduates will be able to assess and analyze the requirements for insurance coverage and to manage insurance costs as a significant expense on construction projects.

Course Objective:

- Discuss the basics of contract law, offers, acceptance, consideration, capacity, legality, bonding process, and insurance requirements.
- Discuss various legal terminologies utilized in contracts and different contractual responsibilities of various parties including the contractual relationship between contractor and sub-contractor
- Discuss dispute resolution processes – negotiation, mediation, arbitration, and litigation
- Develop skills necessary to effectively apply contractual legalities in bidding process and other contractual obligations
- Develop claim control strategies for construction disputes and claims
- Develop project financial and risk mitigation plans including insurance surety and bonds.

Course Learning Outcomes:

Upon successful completion of this course students will be able to:

- Understand the basics laws and processes of construction contracting
- Understand various terminologies used in the construction contracts
- Understand different contractual responsibilities of all stakeholders/parties
- Recognize the bidding processes and other contractual conditions.
- Analyze different general and specific contractual clauses for claims and disputes.
- Develop fundamentals of legal systems in construction.
- Develop project financial and risk mitigation plans using construction insurance, surety and bonds.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Hughes, W., Champion, R. and Murdoch, J., 2015. *Construction contracts: law and management*. Routledge.
- Hinze, J., 2010. *Construction contracts,* 3rd edn. McGraw-Hill Science/Engineering/Math.
- Kelleher Jr, T.J., Mastin, J.M., Robey, R.G., Smith, C. and Hancock, L.L.P., 2014. *Smith, Currie and Hancock's Common Sense Construction Law: A Practical Guide for the Construction Professional*. John Wiley & Sons.

Course:

Course Title: ADVANCED CONSTRUCTION PROCESS AND EQUIPMENT MANGEMENT

Course Number and Code: MCEM 610

Course Pre-requisites: MCEM 604

Course Hours: 3h/week

Course Description:

This course intends to cover the construction processes and equipment management. First, it will develop students' knowledge with contemporary and latest construction management concepts and innovations and how these contribute to the success of thee construction processes. It covers site strategy, risk management, innovation, building process, off-site production, and logistics. In the equipment part the students will understand the types of construction equipment, operations and management as well as decision making related to construction equipment management. It covers equipment ownership, operating costs, scheduling using equipment productivity and cost data. Finally, an overview of major equipment management issues will be presented.

Course Objectives:

- To learn the knowledge of latest construction management concepts and innovations and how these contribute to the success of the construction processes.
- Use and application of advanced tools in risk management, building process, off site production and logistics
- Provide a comprehensive understanding of types of construction equipment and operation management.
- Develop decision for managing construction equipment.
- Provide students with the understanding of equipment ownership, operation costs, scheduling and productivity.

Course Learning Outcomes:

Upon successful completion of this course the student able to:

- Understand the role of construction process management;
- Understand the basic of construction equipment management;
- Identify factors affecting the selection of the construction equipment;
- Demonstrate a general knowledge and applications of site management processes for the efficient and effective resources management in construction sites;
- Appreciate factors affecting site productivity including the various factors and safety at the site level;
- Demonstrate and develop the major equipment management issues

Course Evaluation (grads):

Attendance & weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Douglas D. Gransberg, Calin M. Popescu, Richard Ryan, 2006, **Construction Equipment Management for Engineers, Estimators, and Owners,** CRC press Taylor & Francis group, NW. USA.

Course:

Course Title: Simulation and Design of Construction Operations

Course Number and Code: MCEM 611

Course Pre-requisites: MCEM 610

Course Hours: 3h/week

Course Description:

This course discusses the principles of modelling and simulation for the construction processes. Simulation refers mostly to discrete event simulation. It aims to develop a higher level of comprehensive understanding of the complex construction operations and problem solving. The course also covers the classification and validation of simulation models methods and models such as process oriented simulation, Markov-simulation, trace-driven simulation, analysis of input data and outputs in addition to models of dynamic and stochastic operations for the sake of analysis and design. It also covers Simulation languages and their application on the construction processes, the application of discrete event simulation in building construction processes such as earthmoving operations. A project is required.

Course Objective:

- Discuss the principals of modeling and simulation of construction processes.
- Discuss the applications of probability theories and stochastic processes used in simulation.
- Prepare graduates to develop discrete event simulation, entities, and activities, events and queues, resources activity cycle diagrams
- Prepare graduates to apply methods and techniques to utilize simulation models in complex construction processes.

Course Learning Outcomes:

Upon successful completion of this course, graduates will be able to:

- Understand the simulation concepts with discrete events as an evaluation method in construction operations
- Demonstrate an understanding of some commonly used simulators/simulation tools.
- Develop simulators for carious construction processes activities.
- Analyze simulation results applying adequate statistical methods
- Synthesize complex information, evaluate and generate simulation studies
- Participate in team-works in a harmonized manner for the solution of the targeted problem.
- Write technical report and carry out presentations for simulation related problems.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Wainer, G. A., & Mosterman, P. J. (Eds.). (2016). *Discrete-event modeling and simulation: theory and applications*. CRC Press.
- Wainer, G. A. (2009). *Discrete-event modeling and simulation: a practitioner's approach*. CRC press.

Course:

Course Title: LIFE CYCLE COSTING

Course Number and Code: MCEM 612

Course Pre-requisites: MCEM 602

Course Hours: 3h/week

Course Description:

This course focuses on the Life Cycle Costing (LCC) of construction projects. It covers total cost items of project life cycle including costs of planning, design, acquisition, operation and maintenance, and disposal. Economic analysis concepts and methods are utilized to conduct LCC analysis. It also covers the concepts of depreciation, tax regulations, replacement and breakeven analysis, sensitivity analysis and uncertainties, risk analysis, forecasting techniques, and multi-attributed decision making. In addition, the course introduces graduates to the concepts of Life cycle costing in the asset management, and Managing Buildings through the whole LC Asset Management Methodologies including the asset deterioration, energy consumption, etc. Computer applications for LCC is introduced in this course. The course also aims to enhance the written and oral communication skills necessary, open group discussions, and team work A project is required.

Course Objective:

- Discuss the principals of LCC and components of Life Cycle Cost plan.
- Discusses all the required concepts and methods to conduct a LCC in deterministic and stochastic environments
- Prepare graduates to analyze projects cost items through the whole life cycle of buildings including the use of historical data and forecasting future costs.
- Prepare graduates to utilize all associated theories and analysis methods to develop a LCC analysis for the whole life cycle of buildings in order to optimize budget.
- Demonstrate the computer applications related to project costs and LCC.
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completing this course, students will be able to:

- Recognize the theories and applications related to LCC of Building projects.
- Demonstrate and analyze all related cost items on the life cycle of Building Projects.
- Analyze and apply the deterministic and stochastic approaches to develop a LCC analysis for the whole life cycle of buildings to optimize budget.
- Utilize computer software packages to conduct LCC of building projects.
- Participate in team-works in a harmonized manner for the solution of the targeted problem.
- Write technical report and carry out presentations on the LCC Analysis project.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- White, J. A., Case, K. E., & Pratt, D. B.,2012. *Principles of engineering economic analysis*. Wiley, 6th edition.
- Chan, S. P., 2015. *Contemporary Engineering Economics*. Pearson; 6th edition

Course:

Course Title: Project Risk Management

Course Number and Code: MCEM 613

Course Pre-requisites: MCEM 609

Course Hours: 3h/week

Course Description:

This course introduces graduates to the principals, processes and techniques of Project Risk Management. It covers the skills, knowledge, and methodologies necessary to identify, develop and manage risks at the project level. The course will focus risk management planning, identifying risks, methods of risk quantifying and its tools in addition to risk response planning and monitoring. It also covers methods needed by project managers to develop robust risk management plans to lever projects complexities. The course also prepares graduates to utilize software for the purposes of risk analysis; and analyze and apply risk management industry standards to manage risk.

Course Objective:

- Discuss construction project risks basics, risk sources and risk mitigations
- Discuss and analyze the components of risk management plans.
- Prepare graduates to predict, identify and analyze project scope risks
- Prepare graduates to develop project risks mitigation plans
- Apply quantitative and qualitative risk assessment tools using available computer software

Course Learning Outcomes:

Upon successful completion of the course, students will be able to:

- Identify main components of risk management system and components
- Identify and prioritize project risks,
- Develop a robust project risk mitigation plans
- Develop project budge with contingency funds and spending.
- Implement risk management and mitigation plans using risk software

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Pritchard, C.L. and PMP, P.R., 2014. Risk management: concepts and guidance. CRC Press.
- Kendrick, T., 2015. Identifying and managing project risk: essential tools for failure-proofing your project. AMACOM Div. American Mgmt. Assn.
- Project Management Institute, 2009. Practice standard for project risk management. Newtown Square, PA: Project Management Institute.

Course Title:

Course Title: APPLIED STATISTICS AND DECISION ANALYSIS
Course Number and Code: MCEM 614
Course Pre-requisites: MCEM 605
Course Hours: 3h/week

Course Description:

This course covers qualitative and quantitative methods applied in the decision making and problem-solving processes which can be implemented in the construction management to assist in making decisions under uncertainty; decision-making techniques include financial and decision theory techniques along with risk and sensitivity analysis.
Topics include; data analysis, regression analysis, sampling & distributions techniques and hypothesis testing. Additionally, the course covers SWOT analysis, goal setting, systems thinking, cost-benefit analysis, contingency planning, decision trees, risk assessment, and decision evaluations and it will demonstrate how to use these tools and describe a variety of their applications.

Course Objective:

- Familiarize the students with the basic statistical terms.
- Provide an insight to the advanced statistical techniques of descriptive and inferential statistics including ANOVA, regression analysis and hypothesis testing.
- Apply the statistical knowledge in solving realistic site issues manually and on computer.
- Encourage class open discussion, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completing this course, graduates will be able to:

- Decide the best statistical technique to be used for a specific problem to get the desired results.
- Perform various types of statistical analysis on computer.
- Reach up to a decision to any problem related to building engineering or in general on the basis of the results of statistical analysis.

Course Evaluation (grads):

Attendance & weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Devore, J.L., 2011. *Probability and Statistics for Engineering and the Sciences*. Cengage learning.
- Tzeng, G.H. and Huang, J.J., 2011. *Multiple attribute decision making: methods and applications*. CRC press.
- Kacprzyk, J. and Fedrizzi, M. eds., 2012. *Multiperson decision making models using fuzzy sets and possibility theory* (Vol. 18). Springer Science & Business Media.

Course:

Course Title: BUILING ASSET MANAGEMENT
Course Number and Code: MCEM 615
Course Pre-requisites: MCEM 602
Course Hours: 3h/week

Course Description:

This course focuses the fundamental principles of Asset Management (AM) and discusses the six core questions that should be answered by any organization about their assets. The course also illustrates the implementation approaches of an AM plan to attain sustainability. The course introduces the role of AM in the context of public and private sectors considering the impact of building assets in supporting the organization goals and strategies as well as the needs of different types of building users. It covers topics related to Building Asset Inventory, Building Asset Classifications, Building Asset Hierarchy, Building Performance, Deterioration Prediction, Level of Service, Risk Analysis, Building Life Cycle Costing, Capital Planning, Operation and Maintenance, and Decision Making. Finally synthesizing all the concepts to develop a complete AM plan. The course also aims to enhance the written and oral communication skills necessary, open group discussions, and team work. A project is required.

Course Objective:

- Discuss the concepts and principals of Asset Management and its applications on buildings.
- Discuss the Building Asset Management components and all associated tools and techniques.
- Prepare graduates to analyze data from various sources and utilize the appropriate tools and techniques required for each AM component.
- Prepare graduates to synthesize all analyzed data in order to develop a complete AM plan using different tools.
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completing of this course, graduates will be able to:

- Recognize the concepts, activities, principles, and approaches of AM.
- Demonstrate an advanced and integrated understanding of all AM components and associated tools.
- Analyze different types of data and information from various sources.
- Synthesize complex information, evaluate and generate AM plan related components.
- Participate in team-works in a harmonized manner for the solution of the targeted problem.
- Produce coherent reports and appraisals, and carry out oral presentations on the AM project developed during the course.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Davis, R., 2016. *An Introduction to Asset Management*. Chester, United Kingdom: blah d blah design ltd.
- Woodhouse, J., 2014. Asset management decision-making: The SALVO process. *Hampshire, UK: The Woodhouse Partnership Ltd. ISBN*, 978-0.
- Roper, K. O., & Payant, R. P., 2014. *The facility management handbook*. AMACOM Div American Mgmt Assn.

Course:

Course Title: Building Operation and Maintenance
Course Number and Code: MCEM 616
Course Pre-requisites: MCEM 602 – MCEM 604
Course Hours: 3h/week

Course Description:

This course focuses on the Operation and Maintenance (O&M) procedures related to buildings during the facilities management phase in the building life cycle. It discusses the operations, maintenance and energy management requirements of various types of buildings. It introduces the different types of maintenance and include critical analysis of building components such as structural systems, building interior components, building envelope, HVAC systems, electrical and lighting systems, security and fire safety systems, plumbing system, Building Maintenance Management System (BMMS), etc., including repair cycles and contingency planning. The course also introduces the causes of defects and rates of building components deterioration. Other key aspects of buildings maintenance management are covered including; maintenance policy and standards, asset appraisal and evaluation, work categorization and procurement, information management and maintenance cost. A project is required.

Course Objectives:

- Discuss the principals and applications of the building's maintenance practices comparing the differences between reactive and preventative maintenance.
- Discuss the operation management activities for different types of building systems.
- To develop skills necessary to effectively analyze information related to building defects, their causes and deterioration rates
- To develop skills necessary to effectively synthesize all information to develop the appropriate O&M programs and plans
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completion completing of this course, graduates will be able to:

- Recognize the concepts, principles, and applications of BMMS.
- Recognize the building's operation practices and activities.
- Demonstrate an understanding of building's components and systems.
- Analyze different types of information from various sources utilizing the appropriate tools and techniques.
- Synthesize all the information and develop an O&M program for buildings.
- Participate in team-works in a harmonized manner for an integrated solution of problems.
- Produce coherent reports and appraisals, and carry out oral presentations on the O&M plan developed during the course.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Roper, K. O., & Payant, R. P., 2014. *The facility management handbook*. AMACOM Div American Mgmt Assn.

Course:

Course Title: BUILDING ENERGY MANAGEMENT
Course Number and Code: MCEM 617
Course Pre-requisites:
Course Hours: 3h/week

Course Description:

This course provides students with all the essential knowledge and skills they need to save energy, reduce operational costs and carbon emissions in buildings. Course topics include fundamentals of building heating and cooling loads calculation, HVAC systems, building energy simulation, energy auditing, solution development, and the Building Energy Management Systems principals and applications. As part of this course, students conduct a supervised energy audit visit to an existing building and cover writing an audit report.

Course Objective:

- Provide students with an overall view of the building thermal performance and energy use patterns in buildings, as well as HVAC systems.
- Provide students with basic application knowledge of energy simulation tools.
- Enable students to understand the processes of energy audit and survey, including the use of appropriate instrumentation and calculations.
- Enable students to identify opportunities for energy conservation in existing buildings and prepare reports and presentation.
- Enable students to apply their knowledge of building services systems and efficient operation practices, to upgrade existing buildings and improve new buildings performances.
- Provide students with knowledge of the Building Energy Management Systems

Course Learning Outcomes:

Upon successful completion of the course, students will be able to:

- Understand the building thermal performance, heating and cooling loads and energy use patterns in various types of buildings and the major energy end-uses.
- Understand the fundamentals of HVAC systems and its various types and operation Predict the building energy consumption using energy simulation software
- Carry out energy audits and surveys based on established guideline, identifying energy conservation and management opportunities and prepare audit reports and presentation.
- Apply building energy management principle to achieve highest possible performance;
- Recognize the fundamentals of building energy management systems (BEMS)

Course Evaluation (grads):

weekly performance	10%
Assignments	10%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Kreider, J.F., Curtiss, P.S. and Rabl, A., 2012. *Heating and cooling of buildings: design for efficiency*. CRC Press.
- Lal, J., 2007. *Energy-efficient Building Systems: Green Strategies for Operation and Maintenance*. *MacGraw Hill Book Co*.
- Haines, R.W. and Myers, M.E., 2010. *HVAC systems design handbook*. McGraw-Hill.
- Thumann, A. and Younger, W., 2008. Handbook of Energy Audits, Seventh Edition, The Fairmont Press.

Course:

Course Title: BUIDING PERFORMANCE CRITERIA AND EVALUATION

Course Number and Code: MCEM 618

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This course introduces the concept of building performances, building qualities, performance measurement, performance criteria for different building systems and building types.

In addition, this course introduces the concept of integrated building performance, performance quantification and tracking using performance quantification criteria's and techniques to produce and compile performance data into various format that can be handled and analysed for different facility management purposes mainly operation and maintenance.

Course Objective:

- Discuss the principals and fundamentals of Building Performance
- Identify and develop key Performance Indicator for various building systems
- Determine the main and sub- criteria that govern the evaluation of building systems
- Evaluate various building components based on developed criteria.
- Measure the building performance using different measures and techniques.
- Compare different scenarios and select the most appropriate one(s).
- Make appropriate decision(s) based on the evaluation of building systems.

Course Learning Outcomes:

Upon completion of the course, the student will be able to:

- Understand the fundamentals of Building Performance Evaluation Criteria and its role in the Facility Management Process.
- Understand the methodologies and smart techniques for the evaluation process.
- Develop sound judgement and initiative required to prescribe appropriate testing and modelling methods for Building Performance Evaluation.
- Analyze information using appropriate methods and techniques to measure performance of building systems.
- Synthesize Information using decision analysis techniques to identify building performance.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Preiser, W., & Vischer, J. (Eds.),2006. *Assessing building performance*. Routledge, Elsevier Butterworth – Heinemann.
- Hensen, J. L., & Lamberts, R. (Eds.),2012. *Building performance simulation for design and operation*. Taylor & Francis Group.
- Malkawi, A., & Augenbroe, G. (Eds.),2004. *Advanced building simulation*, Routledge.
- Belton, V., & Stewart, T,2002. *Multiple criteria decision analysis: an integrated approach*. Springer Science & Business Media.

Course:

Course Title: BUILDING SERVICES and OPERATION

Course Number and Code: MCEM 619

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This course focuses on building mechanical, electrical and plumbing (MEP) services. Students will learn the component of each system, how they integrate together via BMS (building management system) and integration strategies with construction works in the design and construction phases. The course discusses the generated issues from work integration such as levels of documentation and decision-making required; connections with process planning. They will get insight about the operation section and how the operations of each systems component affect other component of the same system and other systems in the building.

Course Objective:

- Understanding mechanical electrical and plumping equipment and spatial requirement inside building.
- Discuss the integrate MEP systems.
- Introduce site documentation and different drawing needed in different construction phases
- Understand the main terminologies that are used in site, construction work and MEP systems
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completion of the course student expected to be able to;

- Understand and select the appropriate mechanical, electrical and plumping (MEP) systems for buildings
- Understand the spatial and installation requirements for services during construction process.
- Understand, integrate and prepare MEP services plans and coordination drawing.
- Provide engineered solution for site related issues.
- Maintain and document quality assurance during construction levels of MEP services.

Course Evaluation (grads):

Attendance & weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Grondzik, W. T., & Kwok, A. G., 2014. *Mechanical and electrical equipment for buildings.* John Wiley & Sons.
- Tymkow, P., Tassou, S., Kolokotroni, M. and Jouhara, H., 2013. *Building services design for energy efficient buildings*. Routledge.

Course:

Course Title: LEAN CONSTRUCTION AND RESOURCE MANAGEMENT

Course Number and Code: MCEM 620

Course Pre-requisites: MCEM 604

Course Hours: 3h/week

Course Description:

This course reviews the origin of lean theory that was introduced by the "lean" resolution in manufacturing and production management principles and methods. Key principles include flow, value, variability, and waste. On the other hand, key methods include target costing, value stream mapping, and work flow control. Student groups will apply the LEAN principles and methods on real construction management and operations projects. One mean of applying lean principles is by using process simulation to assess performance of different system configurations and apply the concepts on a real project.

Course Objective:

- Discuss the principles and fundamentals of lean construction techniques.
- Demonstrate the idea of Lean and how it can benefit the construction industry
- Identify the benefits of lean construction to project delivery processes.
- Analyze the factors affecting resources of the construction industry
- Encourage class open discussion, brain storming, group discussions, technical project development, and team work.

Course Learning Outcomes:

Upon successful completion of this course, the student will be able to;

- Understand the key elements of construction management as it relates to lean production and lean construction practices
- Critically evaluate alternative approaches to resource and knowledge management in construction management
- Critically evaluate alternative approaches to project delivery in construction management
- Eliminate/Minimize waste and maximize value for all project participants
- Produce coherent reports and appraisals, and carry out oral presentations on the plan developed during the course.

Course Evaluation (grads):

Attendance & weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Cain, C. T.,2008. *Profitable partnering for lean construction*. John Wiley & Sons.
- Forbes, L. H., & Ahmed, S. M.,2010. *Modern construction: lean project delivery and integrated practices*. CRC Press

Course:

Course Title: COMPUTER APPLICATIONS IN CONSTRUCTION MANAGEMENT

Course Number and Code: MCEM 621

Course Pre-requisites: MCEM 604

Course Hours: 3h/week

Course Description:

This course is designed to introduce students to the latest computer applications in the construction industry with an emphasis on construction documentation, economic problems, estimating, and scheduling. Topics include software applications in different stages of a construction projects starting from the computer aided design, through life cycle costing, planning scheduling, budgeting, conflict detection management, project control, as well as applications in the operation and maintenance phase. A projects will be required.

Course Objective:

- Introduce students to different commercially available computer applications to calculate and control different operations needed in various stages in the construction project.
- Learn available software for planning, scheduling and estimating that is generally used in the construction industry
- Provide students with several computer usages in the construction field.

Course Learning Outcomes:

Upon successful completion of this course, student will be able to:

- Understand, implement and effectively use commercially available software in the various fields of construction management including, quantity take off, scheduling, planning, estimation, life cycle costing in addition to conflict detection.
- Use spreadsheet software to develop spreadsheets for collecting, organizing, and manipulating information.
- Analyze construction plans, as required for performing cost estimating and project scheduling.
- Apply computer based project estimating, using available software tools.
- Apply computer based project scheduling, using available software tools

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Different software manuals and applications (Primavera – Excel, Revit, Microsoft project, Timberline …etc.

Course:

Course Title: GEEN BUILDING DESIGN AND PRACTICES

Course Number and Code: MCEM 622

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This course will cover the fundamental concepts of sustainability in construction by discussing how designers and construction managers can contribute to improving the sustainability in construction by effectively utilizing sustainable sites and landscaping, Passive Design, Indoor Environmental Quality, Energy Efficiency, Renewable Energy, Green construction materials and Hydraulic systems in building. This course also covers various Building Rating Systems. Students are expected to learn how the available strategies, standards and guidelines can be applied to improve sustainability in practice.

Course Objective:

- Gain a basic understanding of the natural, health and engineering issues associated with the design, construction and operation of (sustainable) buildings.
- Understand the concept of sustainability in the built environment.
- Understand the role green building in the context of climate change, energy scarcity and materials.
- Learn about green building incentive programs, certification programs, and local, state and federal policies.
- Gain exposure to cutting edge developments and thinking in the field of Green Building including: Energy retrofits, passive design, water conservation and energy modeling.

Course Learning Outcomes:

Upon successful completion of course the student will able to:

- Understand and implement the concepts of sustainability, green building design and high-performance buildings.
- Identify and apply green building assessment tools to evaluate the sustainability of a building.
- Ability to understand and apply the concepts such as passive design strategies, technologies, and energy conservation measures for efficient buildings.
- Identify the main process of establishing a net zero energy building.
- Ability to design, implement and evaluate the renewable source of energy for the building.
- Interpret green building requirements related to the site, water, air quality, energy consumption and materials and resources

Course Evaluation (grads):

weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course References:

- Kibert, Charles, J., 2013. *Sustainable Construction: Green Building Design and Delivery*, John Wiley & Sons, Inc.
- Regina Leffers, 2009. *Sustainable Construction and Design*", Prentice Hall.
- Mike Montoya, 2010.*Green Building Fundamentals*, Pearson, 2nd edition.

Course:

Course Title: ADVANCED CONSTRUCTION MATERIALS

Course Number and Code: MCEM 623

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This course covers the requirements to analyze, evaluate, and select a range of suitable construction materials for various building projects applications, considering a range of criteria including physical attributes, Life Cycle Costing, and sustainability principals. It also introduces students to the methods and techniques of analyzing the properties and characteristics of materials to determine their suitability for applications in building construction. It requires the selection of materials that comply with relevant legislation, Local regulations, and the Saudi Building Code (SBC), and other regulations and requirements. Training part will be Construction material properties, NDT test methods, and Case studies.

Course Objective:

- Provide students with a clear understanding of how to utilize the knowledge about the behavior and performance of more specialized construction materials, including composites, as applied to structures built from diverse.
- Discuss the characteristics and durability of various advanced construction materials that can affect the strength, durability and safety of construction building materials.
- Provide students with various applications of building construction and collaboration principles process. The course will put the theoretical data into practical concepts by case studies. In general, they will be able to demonstrate;
    - ✓ Effect of environmental factors on building structure
    - ✓ Role and behavior of materials in building construction
    - ✓ Application of new materials for sustainable building

Course Learning Outcomes:

Upon successful of this course, students will be able to;

- Comprehensively explain and criticize the engineering principles used in advanced materials behavior.
- Appraise the use of advanced and sustainable materials as they affect the and adapt techniques in the use of advanced materials to create novel solutions to a wide range of problems.
- Constructively evaluate and endeavor to improve durability health, and safety issues as they relate to the use of materials.
- Explain and debate with technical (NDT) and policy based evidence, complex sustainability and environmental issues related to the use of materials and their application strategies and procedures which take them into account.

Course Evaluation (grads):

Weekly performance	10 %
Assignments	20 %
Term project	30 %
Midterm Exam	15 %
Final Exam	25 %
Total	100 %

Course References:

- Allen, E., & Iano, J.,2011. *Fundamentals of building construction: materials and methods*. John Wiley & Sons.
- Grosse, C. U. (Ed.)., 2007. *Advances in construction materials 2007*. Springer Science & Business Media.

Course:

Course Title: SPECIAL TOPICS IN CONSTRUCTION MANGEMENT

Course Number and Code: MCEM 650

Course Pre-requisites:

Course Hours: 3h/week

Course Description:

This Course can be considered as part of the elective courses and should be directed under individual faculty guidance based on needs, interest, and significance, topics important to student study area of construction management. Course proposals must receive a recommendation from the student's advisor and approval of graduate department's committee. Next include some area related to construction topics; the perspectives and definition of the construction firms for the future; innovative project management processes, new trends in construction organizations; new strategies used for improvement: partnering, benchmarking, value management; role of the project manager in sustainable construction; new areas of management in the construction sector; IT management in CM; Real Estate Sector and related issues.

Course Objectives:

- To give the students the opportunity to investigate and self study special topics related to the construction management fields that may not be covered in the program courses.

Course Learning Outcomes:

Upon successful completion of this course, the student able to;

- learn topics outside the standard curriculum that allows the student to broad their education related to Construction Management.

Course Evaluation (grads):

Weekly performance	10%
Assignments	20%
Term project	30%
Midterm Exam	15%
Final Exam	25%
Total	100%

Course:

Course Title: CAPSTONE PROJECT

Course Number and Code MCEM 680

Course Pre-requisites: MCEM 605

Course Hours:

Course Description:

This course is designed as a capstone project for final year students taken in their last semester. This course is designed to enable students to apply knowledge, skills, and other techniques acquired in the program independently or in groups. Students are expected to select a project which must be reviewed and accepted by the students' supervisor(s). The graduation project is developed through interim presentations and detailed written reports which will reflect the students' abilities to demonstrate professional responsibilities, problem solving, critical thinking, and technical writing.

Course Objective:

- Apply knowledge, skills and techniques in different construction problems.
- Recognize and understanding the professional responsibilities, problem solving, critical thinking, and technical writing
- learn to develop interim presentations and technical reports

Course Learning Outcomes:

Upon successful completing this course, students will be to;

- Recognize problem solving techniques by analyzing and evaluating to apply in construction projects.
- Utilize proper solving techniques for implementing and developing the construction problems in their research projects.
- Utilize knowledge and skills in written and present graduate research projects.
- Work independently or in group on their projects for evaluation by instructors 'and Judgement committee
- Compose a formal report of their research projects

Course Evaluation (grads):

Weekly Performance	20%
Interim presentations	30%
Final presentation & Project	50 %
Total	100%

COURES:

Course Title: MASTER THESIS

Course Number and Code MCEM 690

Course Pre-requisites: MCEM 605

Course Hours:

Description:

The thesis is a project that marks the end of a master's program. It is an original study that represents the results of the student's independent research work and presenting his research findings. Students may start their thesis work after completing Fifteen credit hours (15 cr.) by submitting a research proposal that should be approved by the Graduate Studies Committee and the Department Council. Students are asked to work with a faculty advisor to choose a suitable master's thesis topic in any of the construction management knowledge areas and prepare the thesis proposal. The student has the choice to write the thesis in Arabic or English languages; however, it should follow the approved University formatting guidelines. The thesis will be evaluated by the student's supervisor(s), and at least two examiners appointed by the Graduate Studies Committee and Department Council, one of whom shall be external to the department.

22 Appendix Similar Programs

1 Stanford University

The Sustainable Design and Construction degree programs prepare students for careers in planning, designing, building and operating sustainable buildings and infrastructure to maximize their lifecycle economic value, their net contribution to environmental functions and services, and their social equity.

The SDC-X subprogram offers courses in: project finance; lifecycle assessment; sustainable multidisciplinary, multi-stakeholder planning and design processes; green architecture; performance-based structural design; building energy systems; renewable power generation and smart electrical grids; water supply; wastewater treatment; transportation development; and sustainable construction materials and processes. Classes on cutting-edge information technology, sensor networks embedded in intelligent buildings and infrastructure, strategy, economics, entrepreneurship and organization design for new businesses, and corporate or governmental initiatives aimed at enhancing the sustainability of buildings and infrastructure round out the subprogram.

This subprogram is intended for students with undergraduate degrees in architecture, engineering, science, construction management, economics or business who wish to pursue careers that enhance the sustainability of the built environment.

Employers of past SDC graduates include architectural and engineering design firms, constructors, design-build firms and developers focused on delivering green buildings and infrastructure; energy and sustainability consultants; facility management or sustainability departments within large companies; clean-tech startups; and clean-tech venture funds.

There are five tracks in the SDC subprogram. All five SDC tracks have a common overarching structure and core that includes courses in construction engineering and management and introduces cutting-edge metrics and tools to enhance lifecycle sustainability of the built environment. Each track then offers a different set of additional courses beyond the SDC core to support a specific career direction:

- Sustainable Design & Construction—Management (SDC-M)
- Sustainable Design & Construction — Structures (SDC-S)
- Sustainable Design & Construction — Energy (SDC-E)
- Sustainable Design & Construction — Water (SDC-W)
- Sustainable Design & Construction — Sustainable Urban Systems (SDC-SUS)

- Management (SDC-M)

This track prepares technically qualified students for responsible engineering and management roles in all phases of the development of major constructed facilities. It emphasizes management techniques useful in organizing, planning and controlling the activities of diverse specialists working within the unique project environment of the construction industry, and it covers construction engineering aspects of heavy, industrial and building construction

1..1 SDC-M offers courses in:

- Building systems
- Project finance
- Accounting
- Real estate development
- HVAC design and construction
- Equipment and methods
- International construction
- Labor relations
- Managing human resources
- Planning and control techniques
- Productivity improvement
- Project and company organizations

SDC-M Concentration Class Requirements are:

- Infrastructure Project Development (CEE 241)
- Life Cycle Assessment (CEE 226)
- Organization Design Project (CEE 242)
- Construction Engineering Practicum (CEE 252P)
- Watson Seminar (CEE 258)
- Global Projects Seminar (CEE 241C)

Additional related course work is available from other programs within the department, from other engineering departments and from other schools in the university such as Earth Sciences and the Graduate School of Business. The SDC-M program allows students substantial flexibility to tailor their program of study for careers with general contractors, specialty contractors, real estate or infrastructure developers, or facility owners and operators.

2 Texas A & M University

- Civil Engineering Program

Our program is the largest in the country with more than 440 graduate students and 60 professors in civil engineering. Our graduate program is ranked in the top-10 nationally. Thus we have both quality and quantity when it comes to courses, professors and research projects. We offer two different masters degree programs (M.S. and M.Eng.) and two different doctoral degree programs (Ph.D. and D.Eng.) in nine different areas of civil engineering. Award-winning faculty, state-of-the-art facilities, and the resources of one of the nation's largest research universities combine to make this a great environment for learning and discovery. We hope you will choose to continue your civil engineering education at Texas A&M University.

- One-Year Master of Engineering Degrees

Students can now earn a Master of Engineering degree in one year in the following focus areas:

- Infrastructure Management and Security
- Water Resources Engineering
- Construction Engineering
- Construction Project Management

2..1 DEGREE OF MASTER OF ENGINEERING

Coursework Requirements for a Major in Construction Project Management One Year Program General A minimum of 30 semester credit hours of approved courses is required for the Master of Engineering degree (MEng). A complete discussion of all university requirements is found in the current Texas A&M University Graduate Catalog under the heading “The Degree of Master of Engineering.” For example, university requirements include a final examination and one or two written reports. The Zachry Department of Civil Engineering requires that the examination focus on at least one of the written reports.

Course Requirements

Required – 16 Hours

- CVEN 639 Methods Improvement for Construction Engineers
- CVEN 640 Project Development: Methods and Models
- CVEN 641 Construction Engineering Systems
- CVEN 644 Project Risk Management
- CVEN 689 Engineering Project Controls

Electives (Select Five Courses) – 14 Hours

- CVEN 638 Computer Integrated Construction Engineering Systems
- CVEN 643 Advanced Construction Materials and Methods
- CVEN 654 Strategic Construction and Engineering Management
- CVEN 668 Front-End Planning for Project Execution
- CVEN 689 Special Topics in Probabilistic Risk Analysis in Civil Engineering
- MGMT 655 Survey of Management
- FINC 635 Financial Management for Non-Business

- COSC 628 Applications of Construction Law or COSC 648 Design-Build Project Delivery (but not both COSC
- courses)

- DEGREE OF MASTER OF ENGINEERING

Coursework Requirements for a Major in Construction Engineering One Year Program General A minimum of 30 semester credit hours of approved courses is required for the Master of Engineering degree (MEng). A complete discussion of all university requirements is found in the current Texas A&M University Graduate Catalog under the heading "The Degree of Master of Engineering." For example, university requirements include a final examination and one or two written reports. The Zachry Department of Civil Engineering requires that the examination focus on at least one of the written reports. The report(s), however, need not involve results of research conducted by the candidate. It is the student's responsibility to propose a degree plan that meets all university, department, and program requirements. Degree Plan The student's degree plan must be typed on the official form as it appears on the Internet at http://ogs.tamu.edu/OGS/pdf/plan.pdf and submitted to the construction engineering and management graduate chair with endorsements by the student's advisory committee. The plan must be submitted before the end of the first (fall) semester of study. The office of graduate studies blocks students from further registration if a degree plan is not filed before the end of the second semester of study.

Required – 15 Hours

- CVEN 639 Methods Improvement for Construction Engineers
- CVEN 643 Advanced Construction Methods and Materials
- CVEN 689 Highway Project Development and Project Management (If not available take CVEN 641)
- CVEN 689 Temporary Structures (planned for the future – If not available take CVEN 621, CVEN 659, or CVEN 667)
- COSC 628 Applications of Construction Law

2..1 Electives (Select Five Courses) – 15 Hours

- CVEN 615 Structural Design of Pavements
- CVEN 621 Advanced Reinforced Concrete Design
- CVEN 635 Street and Highway Design
- CVEN 638 Computer Integrated Construction Engineering Systems
- CVEN 641 Construction Engineering Systems
- CVEN 644 Project Risk Management
- CVEN 654 Strategic Construction and Engineering Management
- CVEN 659 Behavior and Design of Steel Structures
- CVEN 667 Slope Stability and Retaining Walls
- CVEN 671 Design and Behavior of Prestressed Concrete Structures
- OCEN 688 Marine Dredging

- COSC 631 Supervision of Construction Workforce or COSC 664 Construction Safety Management (but not both COSC courses)

The Master of Science degree is a research-oriented degree requiring a minimum of 32 credit hours of approved courses and research. At least 24 credit hours must be coursework. The degree also requires the student to complete and submit a thesis to the University. There are department-specific and area-specific requirements for the completion of this degree in addition to the university requirements.

2..2 Step 1 - Form an Advisory Committee

Students are required to form an advisory committee within the first two semesters of study. The committee consists of 3 or more graduate faculty members. The chair of the committee must be from the Department of Civil Engineering. At least one member of the committee must be from outside the Department of Civil Engineering.

2..3 Step 2 - Submit Degree Plan

A degree plan is required to be filed with the Office of Graduate Studies by the end of the student's second semester. The degree plan formally declares your degree objectives, the membership of your advisory committee, and the specific courses you will be required to complete as part of your degree program.

2..4 Step 3 - Submit Research Proposal

The research proposal outlines the research that you will conduct in pursuit of a degree. This proposal outlines the strategies and methods that will be used. The proposal must be approved by the advisory committee.

2..5 Step 4 - Thesis

A draft of the thesis must be approved by the advisory committee. The thesis draft should be submitted to the advisory committee at least two weeks prior to the final defense date. Consult the Thesis Clerk or review the Thesis Manual for the formatting guidelines.

2..6 Step 5 - Apply for Degree

Contact the Graduate Program office for specific dates.

2..7 Step 6 - Final Defense

A final oral examination is required. The student presents and defends his or her research efforts, as given by the thesis. The examination should emphasize the methodology and results of the thesis. The exam should also afford students an opportunity to make a logical, effective oral presentation, complete with visuals, and demonstrate their ability to respond to questions by the advisory committee. With the passing of the final examination and acceptance of the thesis by the advisory committee, the thesis, with approval from the Departmental Graduate Advisor, is submitted to the University as a formal document.

The Master of Engineering degree is a professionally oriented degree for students looking to practice the engineering profession at an advanced level. A minimum of 30 semester credit hours are required for this non-thesis degree. There are department-specific and area-specific requirements for the completion of this degree in addition to the university requirements.

2..8 Step 1 - Form an Advisory Committee

Students are required to form an advisory committee within the first two semesters of study. The committee consists of one to three graduate faculty members. For most students the committee will consist of one professor from the Zachry Department of Civil Engineering.

2..9 Step 2 - Develop and Submit a Degree Plan

The student and their advisory committee choose the courses they will take as part of their degree. These courses and your committee member name(s) are your degree plan and are submitted online (http://ogsdpss.tamu.edu). You cannot register for your third semester until your degree plan is filed. So complete it early in your second semester!

2..10 Step 3 - Submit Professional Report

While a thesis is not required for this degree, the University requires that the student's effort towards the degree include one or two written reports (not necessarily involving results of research conducted by the student). This requirement is usually satisfied by reports written for specific courses taken as part of the student's degree plan. The requirement can also be satisfied by submitting a report as part of CVEN/OCEN 685 - Directed Studies.

2..11 Step 3 - Apply for Degree

This can be found on the Office of Graduate Studies calendar. Contact the Graduate Program office for specific dates.

Purdue University

- MS in Building Construction Management

A master's degree in building construction management provides an educational experience to prepare you for leadership positions within the construction industry. This thesis-based program gives students the opportunity to work and study with faculty members who have prominent reputations in the construction industry. Students will have the opportunity for individualized studies in construction management.
This program is for individuals with a bachelor's degree in construction management and who have demonstrated a thorough understanding of construction project management through experience.

BCM 51000 Topics in Environmentally Sustainable Construction, Design and Development - This course explores environmental sustainability in all its forms, starting with the historical and theoretical basis and continuing through an understanding of sustainable building construction, design, development, and renewable energy strategies/management tools and how these can be applied in practice. Typically offered Fall Spring Summer. 3 Credit hours, CRN 15553

BCM 52500 Managing Construction Quality - Advanced techniques for assessing the success of construction project management including schedule cost, safety and quality measurements. Impacts of pre planning, human factors, and communication systems on quality and productivity. Statistical methods for analysis of construction operations. Typically offered Fall. 3 Credit hours, CRN 15075

BCM 53500 Construction Accounting and Financial Management - Accounting techniques, financial methods, and financial management for construction firm management. Analysis techniques for contemporary construction company accounting and finance practice with an emphasis on cash flow analysis and cash management. Typically offered Fall. 3 Credit hours, 15090

BCM 56000 Academic Writing Seminar I

BCM 56500 Academic Writing Seminar II

BCM 58100 Workshop in BCM

Simulation and Model Construction Operations

Research Seminar

3 Arizona State University

The graduate degree programs at Del E. Webb School of Construction (DEWSC) offer opportunities for study beyond the bachelor's degree in one of two areas: construction management or facility management. Studies may lead to the degrees of Master of Science (M.S.) and Doctor of Philosophy (Ph.D.). If an admitted student does not have an undergraduate degree in construction or facility management, they may be assigned deficiency courses specific to their specialty area. Students must earn a grade of "B" or better in each deficiency course.

Graduate study, particularly that leading to the PhD, has as a goal of ensuring independent scholarship, originality, and competence in research. Research opportunities are available in a broad spectrum of subjects encompassing traditional as well as new specialties. The DEWSC faculty is engaged in significant research in the following areas:

- Alternative project delivery methods
- Front end planning
- Asset management
- Cleanroom construction
- Computer applications in construction
- Concrete construction
- Facilities Administration
- Operations & Maintenance
- Building Energy Management
- Leadership and management
- Trenchless construction methods
- Performance information procurement systems
- Productivity
- Residential construction
- Safety and risk
- Sustainable development

The Facility Management M.S. concentration is IFMA Accredited, and supports the needs of students desiring a career in the maintenance, operation, renovation, or decommissioning of existing facilities.

SPECIFICS OF THE PROGRAM INCLUDE:

- Thesis and Non-Thesis options available (chat with an advisor to discuss the best option for you)
- 30 credits (10 classes or 8 classes with a Thesis)
- Can be taken Online or In person
- Courses taught by academic and industry professionals

Beyond a cutting-edge FM education, students will also learn advanced business processes, leadership skills, and how to create efficiency within their job function. Each student will also have the opportunity to earn their FMP and SFP certifications, which are built into the coursework.

courses*

- Operations & Maintenance
- Facilities Administration
- Building Energy Management
- Facilities Project Management
- Sustainable Facilities
- Advanced Business Processes
- Leadership Principles
- Applied project
- Numerous electives offered
- Internships available

Project Management Core Area (3 credit hours)

CON 530 Facilities Operations and Maintenance (3) CON 532 Facilities Project Management (3) CON 545 Construction Project Management (3) CON 551 Alternative Project Delivery Methods (3) CON 557 Principles of Leadership for Project Managers (3)

Project Controls Core Area (3 credit hours)

CON 540 Construction Productivity (3) CON 567 Advanced Procurement Systems (3) CON 589 Construction Company Financial Control (3)

Construction Technology Core Area (3 credit hours)

CON 531 Facility Management: Building Energy Management (3) CON 554 Trenchless Construction Methods (3) CON 570 Introduction to Advanced Technology Facilities (3) CON 571 Construction of Advanced Technology Facilities (3) CON 575 Information Technology in Construction (3)

Electives or Research (15-21 credit hours)

Culminating Experience (0-6 credit hours)

CON 593 Applied Project (3) CON 599 Thesis (6) written comprehensive exam (0)

4 University of Berkley

- Graduate
  - CE 268A Lean Construction Concepts and Methods
  - CE 268B Lean Construction and Supply Chain Management
  - CE 268D Law for Engineers
  - CE 268E Civil Systems and the Environment
  - CE 268H Advanced Project Planning & Control
  - CE 268I Business Fundamentals for Engineering
  - CE 292A Technologies for Sustainable Societies
  - CE 293A Technology and Sustainability
  - CE 298 Graduate Research Seminar
  - CE 299 Individual Research or Investigation in Selected Advanced Topics

4..1 Certificate of Construction Management

4..2 Courses

- ARCH X420.2 - Construction and Facilities Project Management
- CIV ENG X400.8 - Construction Enterprise Risk Management
- CIV ENG X451 - Preconstruction Estimating: From the Design Development Stage to the Final Bid Process
- CIV ENG X452 - Managing Performance, Risk and Safety in Construction Projects
- CIV ENG X463 - Construction Project Scheduling and Control
- CIV ENG X464 - Management in the Construction Industry
- CIV ENG X479.1 - Management and Supervision: Systems, People and Performance
- CIV ENG X479.2 - Lean Construction Transformation
- CIV ENG X486 - Construction Materials and Methods
- CIV ENG X490 - Sustainable Construction Management and Field Practices
- CIV ENG X493.1 - Building Commissioning for LEED
- CIV ENG X494 - Introduction to BIM: Virtual Design and Construction Technology
- CIV ENG X495 - Introduction to LEED v4: Concepts of Green Building and Design
- CIV ENG X495.1 - Intermediate LEED v4: Applications of Green Building Practices
- CIV ENG X496 - Advanced LEED v4: Implementing LEED Strategies
- CIV ENG X498.3 - Schedule Delay Analysis and Construction Claims
- IDS X440 - Fundamentals of Construction Law

5 American University in Cairo

- CONSTRUCTION ENGINEERING (M.SC.)

The Master of Science program in Construction Engineering is administered by the Construction and Architectural Engineering Department. The Program offers high quality education that prepares students for advanced academic, research and professional careers in construction management & systems and structural engineering & construction materials.

5..1 Program Objectives

The objectives of the Master of Science in Construction Engineering are to provide the graduates of the program with:

- A broad knowledge of modern computational and experimental methods in engineering.
- Extensive knowledge in construction management & systems and in structural engineering & construction materials
- In-depth understanding of the research techniques and data analysis in construction engineering
- An ability to solve unstructured engineering problems, think critically, function well in a team, and communicate effectively
- A high standard of written and oral communication on technical matters

5..2 Admission

A candidate for the master's program in Construction Engineering must have a B.Sc. degree in civil, construction or architectural engineering. Students who have some deficiency in their undergraduate training but are well-qualified in other respects may be admitted provisionally. The Department of Construction and Architectural Engineering may prescribe a program of noncredit work to make up for the deficiency.

5..3 Courses (24 credit hours)

A minimum of eight courses (24 credit hours) is required. The courses are selected from the following categories:

5..4 I- Core Courses (6 credit hours)

All students select two out of the following four ENGR core courses:

- ENGR 511/5202 - Computational Methods in Engineering (3 cr.)
- ENGR 512/5210 - Experimental Methods in Engineering (3 cr.)
- ENGR 516/5240 - Engineering for a Sustainable Environment (3 cr.)
- ENGR 518/5204 - Engineering Statistics (3 cr.)

5..5 II- Concentration Courses (12 credit hours)

Students should select a minimum of four courses from any of the courses of the following subfields in Construction Engineering:

5..6 Construction Management and Systems

- CENG 570/5244 - Advanced Construction Management (3 cr.)
- CENG 571/5225 - Advanced Systems Analysis for Construction Engineering (3 cr.)
- CENG 572/5245 - Claims and Disputes in the Construction Industry (3 cr.)
- CENG 574/5226 - Methods and Equipment for Construction (3 cr.)
- CENG 575/5246 - Techniques of Planning, Scheduling and Control (3 cr.)
- CENG 576/5227 - Advanced Systems for Construction (3 cr.)
- CENG 578/5247 - Resource Management for Construction Projects (3 cr.)
- CENG 565/5241 - Infrastructure Asset Management (3 cr.)
- CENG 566/5242 - Simulation Applications in Construction (3 cr.)

5..7 Structural Engineering and Construction Materials

- CENG 573/5220 - Advanced Construction and Building Materials (3 cr.)
- CENG 577/5210 - The Finite Element Method in Structural Engineering (3 cr.)
- CENG 579/5121 - Assessment, Protection and Repair of Structures (3 cr.)

5..8 III- Elective Courses (6 credit hours)

A minimum of two courses are selected as electives. The courses are selected from a set of graduate courses in engineering, physical sciences, social sciences, management and other related graduate level courses subject to advisor and chair's approval. No more than one 400-level course in engineering, computer science and other related areas, not in the student's undergraduate major, may be taken for graduate credit subject to advisor and chair's approval. A minimum of one course must be selected from the concentration courses in Construction Engineering

- CENG 592/5292 - Advanced Topics in Construction Engineering (3 cr.)

May include:

- Geotechnical Engineering
- Construction Technology Analysis and Development
- Advanced Structural Design and Construction

Thesis

Graduate thesis work is an important and required part of the Construction Engineering Master of Science degree program. Each student must submit a thesis topic that has been approved by a faculty advisor by the end of the first academic year. Various research topics are discussed in ENGR 5940 and ENGR 5941, Graduate Thesis Seminar I and II. Students must register in ENGR 5940 before submitting a thesis topic and in ENGR 5941 during execution of the thesis research to present their thesis plan. To ensure adequate faculty consultation on the thesis, the student must register for CENG 5290, Graduate Thesis, by the completion of 18 credit hours. Students must register in CENG 5290 for at least two semesters. The first two registrations in CENG 5290 must be for three credit hours, after that CENG 5290 is taken for one credit hour each semester until completion of the program requirements.

6 Carnigie Mellon University

Graduate Degree Programs

For a more comprehensive guide to graduate programs in the environment visit: Guide to Graduate Study in the Areas of Energy, Environment and Sustainability [pdf]

College of Engineering (CIT)

- Chemical Engineering—M.S., Mache, Ph.D.
- Civil and Environmental Engineering with Concentration in Green Design—M.S., Ph.D.
- Environmental Engineering, Science, and Management—M.S., Ph.D.
- Architecture-Engineering & Construction Management Program (administered by the School of Architecture and involves studies in both Architecture and Civil and Environmental Engineering)—M.S.
- Civil and Environmental Engineering and Master of Business Administration Program (with Tepper)—M.S./MBA
- Civil and Environmental Engineering/Engineering and Public Policy [with EPP]—Ph.D.
- Energy Science, Technology, and Policy—M.S.
- Engineering and Public Policy—M.S.
- Engineering and Technology Innovation Management—M.S.
- Materials Science & Engineering Course Option—M.S.
- Materials Science & Engineering Research Option—M.S.
- Materials Science & Engineering—Ph.D.
- Mechanical Engineering Course Work Option—M.S.
- Mechanical Engineering Project Option—M.S.
- Mechanical Engineering—Ph.D.
- Product Development with the College of Fine Arts—M.P.O.
- College of Fine Arts (CFA)
- Building Performance and Diagnostics—M.S., PhD.
- Architecture-Engineering-Construction Management—M.S., Ph.D.
- Sustainable Design—M.S.
- Urban Design—M.S.
- Art—M.F.A.

6..1 Program Overview

The Master of Science in Architecture–Engineering–Construction Management (MSAECM) Program is jointly offered by the School of Architecture and the Department of Civil & Environmental Engineering.

The MS in Architecture–Engineering–Construction Management degree program is intended for practitioners, researchers, and educators in engineering, architecture, construction management fields, and other professionals in the building industry who wish to be leaders in advanced management technologies and their application to the built environment.

The program is designed to accommodate flexibility in the admission and graduation needs of candidates through program length and prerequisite courses that build up toward more advanced courses.

SoA offers two versions of the program, with varying residency requirements. The 9-month program is custom-designed for applicants with professional experience and advanced standing in core course categories. The 16-month program is designed for all other applicants. Both versions begin in the fall semester.
Please feel free to contact Track Chair Erica Cochran Hameen with questions about the MSAECM program.

6..2 Curriculum

Graduates of both versions of the MSAECM program must satisfy three subject categories: Microeconomics, Quantitative Methods, and Project Management. Each category is designed with prerequisite, core and advanced courses to allow students to begin at a level of difficulty appropriate for their background. All students are also required to complete a synthesis course sequence to apply theory they have covered in core courses to real project settings. The remainder of the coursework is completed through electives designated in the curriculum description.
In addition, 16-month students are required to complete a summer internship course during the summer semester.

7 University of Washington

- Masters in Construction Management (classroom-based)

7..1 Degree Requirements

Students must complete a total of 45 quarter credits (the equivalent to 30 semester credits) to earn the Master of Science degree. Core courses account for 9 credits; they must be graded credits. Students who choose to write a thesis (9 credits), complete 27 credits; students who write a research paper instead (3 credits), must complete 33 credits. A maximum of 12 non-CM credits can be applied toward the degree. At least 18 credits must be graded credits. Get more information about the curriculum and requirements for this degree in the CM Masters Handbook.

- CM Masters Handbook (pdf)
- Thesis Guidelines (pdf)
- Research Paper Guidelines (pdf)
- Degree Planning Form (pdf)
- Construction Management Course Catalog
- This is a STEM accredited program. Check the list of UW STEM programs on this page (select “STEM” at the bottom of the left side bar)

The following six focus areas are offered in the Master of Science in Construction Management Program–details on these areas can also be found in the CM Masters Handbook.

1. Integrated Project Delivery Systems
2. Sustainable Built Environment
3. Infrastructure Development
4. International Construction
5. Virtual Design and Construction
6. Safety and Health in Construction

8 King Fahd University for Petroleum and Minerals

- Academic Programs

8..1 Construction Engineering and management -Master of science Program (CEM-MS)

To obtain the M.S. degree in CEM, the student must complete 30 credit hours: 15 credits of core courses, 6 credits of CEM-elective courses, 3 credits course from outside the CEM Department, research seminar and a 6 credit hours of M.S thesis. For more details

8..2 Construction Engineering and management -Master of Engineering Program (CEM-ME)

The M.E. option requires the completion of 33 credit hours, which include 18 credit hours of core courses, 6 credit hours of CEM electives, 3 credit hours of non-technical or business , 3 credit of graduate electives courses either from or within or outside the CEM Department , a research seminar and 3 credit hours of Master of Engineering Report . for more details click on the below link

- Course Description - Construction Engineering And Management

8..1 CEM 510 Project Planning & Scheduling (3-0-3)

Planning, scheduling, and control of construction projects using Critical Path Method (CPM) and Project Evaluation and Review Technique (PERT); Resource leveling; Scheduling with limited resources; Time-cost tradeoffs, Introduction to complex networks, short interval production scheduling , and related Computer applications.
Prerequisite: Graduating Standing

8..2 CEM 511 Construction Estimating (3-0-3)

Introduction to cost aspects of construction, Quantity take-off methods, labor and equipment production rates, Unit Costs, Overhead, and Profits as they relate to the preparation of construction estimates. Creation and coordination of cost control systems with regard to engineering, estimating constructing, purchasing and subcontracting procedures for construction projects, Conceptual Estimating, Computer applications.
Prerequisite: Graduate Standing

8..3 CEM 512 Value Engineering (3-0-3)

Value engineering concepts, function analysis system techniques (FAST), diagramming, creativity, matrix evaluation, design-to-cost, life cycle costing, human relations and strategies for organizing, performing and implementing value engineering; Computer applications.
Prerequisite: CEM 511

8..4 CEM 513 Construction Productivity (3-0-3)

Components of the construction productivity system; measurements of productivity: Work sampling, Craftsman's Questionnaire, Foreman Delay Survey, and related techniques. Construction methods improvement: Crew Balance, Chart, Flow Diagram and Process Chart, Quality Circles; safety workers' motivation and productivity improvement programs. Application of above techniques on real construction projects, Computer applications.
Prerequisite: Graduate Standing

8..5 CEM 514 Modeling of Construction Operations (3-0-3)

Introduction to business process reengineering. Investigation of quantitative methods used for the design and analysis of construction operations to maximize productivity and minimize resources idleness. Discussions on queing theory, line of balance technique, and simulation. Comprehensive group projects involve modeling and analyzing actual construction operations, Computer applications.
Prerequisite: Graduate Standing

8..6 CEM 515 Project Quality Management (3-0-3)

The objective of this course is to expose students to Quality knowledge and Quality improvement methods. Includes discussion on Quality standards, Quality needs and overall strategic plans, customer satisfaction and focus, tools for Quality Project Management, Statistical process control, tools for continous improvement, recent developments in Quality in Constructed projects, ISO standards, survey of computer application software related to quality management.
Prerequisite: Graduate Standing

8..7 CEM 516 Project Risk Management (3-0-3)

Putting risk into perspective, risk and uncertainty, risk management system, decision theory, game theory, utility and risk attitude, multicriteria decision making models, simulation, risks and the construction project – money, time and technical risks, contracts and risks, Computer applications.
Prerequisite: OM 502 or Equivalent, CEM 510, CEM 520

8..8 CEM 517 Construction Safety Management (3-0-3)

The objective of this course is to explain how to manage safety in Construction Projects and show why safety management is a key part of an effective Construction Mangement. The course gives specific recommendations to overall improvement of construction safety and outlines steps to reduce accidents in construction site. Students are also exposed to the available safety softwares and other computer applications.
Prerequisite: Graduate Standing

8..9 CEM 518 Project Cost Management (3-0-3)

The course includes the application of scientific principles and techniques to the problems of cost planning and cost control. The course covers a variety of issues in cost management

including evaluating investment alternatives, life cycle costing, cost analysis methods, cost control, and computer applications.
Prerequisite: CEM 511

8..10 CEM 520 Construction Contracting and Administration (3-0-3)

Basic characteristics of the construction industry; interrelationship of the design and construction processes, construction contract documents, bidding and awarding procedures, construction claims and disputes, national labor and procurement regulations, leadership, computer applications.
Prerequisite: Graduate Standing

8..11 CEM 522 Globalization and Construction Industry (3-0-3)

The course will expose the students to the differences in Construction systems, technology, management and culture among the advanced industrial countries, newly industrialized countries and local construction industry. Globalization movement and its effect on construction industry and local design and construction firms. Special aspects of International projects including investigation, planning, procurement, logistics, personnel and financing.
Prerequisite: CEM 520

8..12 CEM 525 Project Delivery Systems (3-0-3)

The historical evolution of project delivery, the roles of procurement and contracting methods in project success, strengths and weaknesses of contemporary delivery system. Emphasis will be placed on new trends in the Project Delivery Systems such as Construction Management (CM), Design-Build (DB), Build Operate and Transfer (BOT), Build Own, Operate and Transfer (BOOT), etc.: when to use, process variations, procurement, contracts and contracts language, performance specification, roles of parties, organization and management, conceptual estimating; , Lean construction; Computer applications.
Prerequisite: CEM 520

8..13 CEM 527 Construction Claims and Dispute Resolution (3-0-3)

Construction claims, Causes and types of construction claims, construction disputes, causes and types of construction disputes, disputes avoidance techniques, problems of traditional dispute resolution techniques, alternative dispute resolution techniques – Arbitration, mediation, conciliation, dispute review boards, mini trials, professional ethics, and Computer applications.
Prerequisite: CEM 520

8..14 CEM 530 Construction Engineering (3-0-3)

Construction Engineering fundamentals, equipment economics, selection and efficient application of equipment, design and simulation of construction operations, analyzing production outputs and cost; Computer applications.
Prerequisite: Graduate Standing

8..15 CEM 531 Heavy Industrial Construction (3-0-3)

Design interdependencies, procurement, construction and start-up of heavy industrial facilities, power plants, chemical plants, oil refineries. Design interfaces, specifications, drawings preparation. Procurement contracts, fabrications, quality control. Construction; Site, structural, piping and vessels, electrical, instrumentation. Job planning and organization. Facility start-up, case studies, Computer applications.

Prerequisite: CEM 530

8..16 CEM 532 Design & Cons. of Temporary Support Structures (3-0-3)

Planning and field engineering for temporary support structures. Design and Construction of concrete formwork, cofferdams, scaffolding, dewatering systems, and other temporary structures required by construction operations, Computer applications.

Prerequisite: Graduate Standing

8..17 CEM 533 Intro. to Constr. of Harbor, Coastal & Ocean Structures (3-0-3)

Construction methods and equipment for construction of cofferdams, caissons, wharves, marine terminals, outfall sewers, power plant intakes and discharge, submarine oil and gas pipelines, dredging, offshore platforms, ocean structures, sub-sea and deep ocean facilities, case studies.

Prerequisite: CEM 530

8..18 CEM 540 Project Management (3-0-3)

An integrative perspective to Construction Project Management to tie together knowledge areas of Project Mangement that have been individually covered under various courses such as Planning and Scheduling, Cost Estimating, Quality Management, Human Resourses Management and Risk Management. Other areas to be covered include Project procurement management, Project communication management, and Computer applications.

Prerequisite: CEM 510, CEM 511, CEM 520

8..19 CEM 542 Technology and Innovation in Construction & Proj. Mgmt. (3-0-3)

Technology concepts; terminology and classifications. Construction advanced technologies. Emerging technologies and construction applications. Technology management in construction: R&D; technological innovation; technology deployment; support techniques. Construction technology in Saudi Arabia: innovative behavior; strategy; policy; support system; university/industry interaction, sustainability, lean construction. Research projects for industry applications.

Prerequisite: Graduate Standing

8..20 CEM 549 Construction Management Information Systems (3-0-3)

Design of computerized Management Information System (MIS) in the construction industry. Students perform microcomputer database and spreadsheet programming to develop estimating, planning and scheduling, financial and cost accounting, and project control subsystems having common, integrated data structures, 3D/4D CAD, Project websites, e-

business an supply chain management. Students implement subsystems as an integrated MIS, which they apply to construction problems and case studies.
Prerequisite: CEM 510, CEM 511

8..21 CEM 590 Special Topics in Construction Engineering & Management (3-0-3)

Advanced topics selected from the major areas of Construction Engineering and Management to provide the student with recent developments.
Prerequisite: Graduate Standing

8..22 CEM 599 Research Seminar (1-0-0)

Introduction to the principles of scientific research: The research question, hypotheses, constructs and their operationalization, research design, internal and external validities of research findings, measurements and their reliability, data collection techniques, basic elements of the research proposal. Grades are pass or fail.
Prerequisite: Graduate Standing

8..23 CEM 600 Master of Engineering Report (0-0-3)

A report on an independent study performed under the supervision of a CEM faculty advisor. This paper should include an introduction to the topic, literature review, research methodology, analysis of data, conclusions and recommendations, appendixes and references. The report will be presented and orally examined by a faculty committee.
Prerequisite: CEM 599

8..24 CEM 610 Thesis (0-0-6)

The student has to undertake and complete a research topic under the supervision of a graduate faculty member in order to probe in-depth a specific problem in Construction Engineering and Management.
Prerequisite: CEM 599

9 Manchester University

- Course description

The MSc in Construction Project Management prepares students for a professional role in the management of construction projects by providing students with an understanding of both the people-related and technical requirements necessary for the successful management of projects, as well as the organisational and strategic aspects; it also stresses the project control mechanisms of resource management, budgeting and cost management, change control, contract management and information management.
This MSc is one of four MSc courses within the Management of Projects Group of Programmes. The other MSc courses are: Management of Projects, Commercial Project Management and Engineering Project Management.
The School of Mechanical, Aerospace and Civil Engineering has a long history of delivering project management related masters courses and the staff who deliver the programme are drawn for a wide variety of backgrounds and industrial experience.

- Teaching and learning

The Construction Project Management MSc is a full time course which is studied over 12 months, starting in September each year. The course comprises eight taught course units, each worth 15 credits, and a research dissertation worth 60 credits. Students on this particular MSc study four core units fundamental to project management, and which are shared by students on the other MSc courses. In addition, the Construction Project Management Professional Practice unit is programme specific unit which is designed to simulate the major challenges to delivering a successful construction/civil engineering project through the medium of a `live' case study approach. Students must also select three option units and carry out a Construction Project Management based dissertation.
Assessment of the taught part of the programme is via a combination of formal written examinations and coursework assignments, which will include group work and oral presentations. Some assessment is based on online material provided by the Association for Project Management (APM) and PRINCE2 (a process-based method for effective project management).

- Course unit list

The course unit details given below are subject to change, and are the latest example of the curriculum available on this course of study

- People and Organisations
- Project Planning and Control
- Project Management Research Methods
- Management of Projects
- Construction Project Management Professional Practice
- MoP Dissertation
- Environmental Assessment

- Project Finance for Infrastructure Projects
- Conflict Management & Dispute Resolution
- Contract Management
- Risk Management

10 Heriot Watt Dubai

- Overview

There is a very high level of demand for qualified construction project managers in the global construction industry. This programme produces qualified project managers of the quality required by the UK, Middle Eastern and global construction industries, both in terms of their immediate ability to perform and their longer term strategic potential. Taught from the perspective of construction project management, with principles that apply far beyond this sector, the programme provides students with access to both a solid theoretical base and current and future strategies in practical project management.

10..1 Professional recognition

The programme is accredited by both the Royal Institution of Chartered Surveyors (RICS) and by the Chartered Institute of Building (CIOB).

10..2 January entrants

Students starting the programme in January should note that it runs full-time for 2 semesters (12 months) + dissertation (February to April, 3 months) (total 16 months), or part-time runs for 4 semesters (24 months) + dissertation (March to August, 6 months) (total 30 months).
Students enrolling for the January intake programmes are not required to be be on campus during the summer break
Full-time students undertake four courses in semester one and a further four courses in semester two.
Taught courses include:

- Project Management: Theory and Practice
- Contracts and Procurement
- Project Management: Strategic Issues
- Value and Risk Management
- People and Organisational Management
- Construction Financial Management
- Construction Practices and Information Technology
- Sustainability in Civil Engineering (optional)
- Construction Technology (optional)

In addition to these taught courses, students pursuing the Masters qualification undertake a research project. Students can study individual courses to meet the continued professional learning requirements of the built environment professions.

11 State University of New York College of Environmental Science and Forestry

- Graduate Study in Construction Management and Sustainable Construction

Graduate options in construction management and sustainable construction allow students with technical degrees to engage specific topics of current interest.
There is an overall objective of having students look at the broad environmental implications of the construction process, to be efficient and environmentally responsible in their use of materials, and to integrate current technology to a practicum or thesis, as appropriate to the graduate degree.
There are two graduate options for those pursuing M.S. or M.P.S. degrees:

11..1 Construction Management

This option is for students who plan to specialize in construction management. Studies depend upon the student's previous education, professional objectives and interests.
Recent graduates have matriculated upon completion of undergraduate degrees in architecture, mechanical engineering, construction management and civil engineering.
M.S. in Construction Management
Applicants for the M.S. degree in the construction management option are required to have a bachelor's degree in one of the following: science, construction management, business, management, architecture or engineering.
Topics for M.S. research may include the following areas in the management of construction projects: Construction project management, Estimating, cost engineering, building codes and zoning, Production management, Computer graphics and computer applications in construction.
M.P.S. in Construction Management
The M.P.S. degree is a non-thesis degree open to students with a demonstrated interest in the profession of construction management. A bachelor's degree in one of the following is strongly recommended: science, construction management, business, management, architecture, engineering, or related field of study.

11..2 Coursework

- Required: 12 cr hrs
- Directed Electives: 6-12 cr hrs
- Open Electives: 3-9 cr hrs
- Practicum/Synthesis Project: 3-6 cr hrs
- Total credit hours: 30 cr hrs

Coursework requirements are described in the Academic Catalog.

11..3 Sustainable Construction

This option is for students interested in sustainable construction practices including topics such as energy use in buildings, material use in sustainable construction, life cycle analysis, environmental rating systems and environmental performance measures.

Students with a strong background in science are given greater consideration.

11..4 M.S. in Sustainable Construction

Applicants for the M.S. degree in sustainable construction are required to have a bachelor's degree in one of the following: science, construction management, architecture or engineering. It is preferred that students have a science background and to have completed courses in physics, chemistry and calculus.

Topics for the M.S. or Ph.D. research may include the following: Energy systems in buildings, Sustainable materials, Environmental performance measures, Building codes, Renewable materials, Deconstruction and reuse, Life cycle analysis, building performance.

11..5 M.P.S. in Sustainable Construction

The M.P.S. degree is open to students with a demonstrated interest in sustainable construction such as properties of construction materials, energy systems in buildings, rating systems and building performance. A bachelor’s degree in one of the following is strongly recommended: science, construction management, architecture, engineering, or related degree. It is preferred that students have a science background and to have completed courses in physics, chemistry and calculus.

11..6 Coursework

- Required: 12 cr hrs
- Directed Electives: 6-12 cr hrs
- Open Electives: 3-9 cr hrs
- Practicum/Synthesis Project: 3-6 cr hrs
- Total credit hours: 30 cr hrs

Coursework requirements for are described in the Academic Catalog

12 Arab Academy for Science, Technology & Maritime Transport

12..1.1 M.Eng In Construction Engineering And Management

Core Courses	Elective Courses	Master's Thesis Research

Core Courses		
Code	**Title**	**Prerequisite**
CB 710	Advanced Construction Engineering	None
CB 711	Value Engineering in the Construction Industry	None
CB 712	Advanced Construction Management	None

Elective Courses		
Code	**Title**	**Prerequisite**
Group I (4 Courses)		
CB 713	Construction Equipment Management	None
CB 714	Advanced Systems Analysis for Construction Engineers	None
CB 715	Special Topics in Concrete Construction	None
CB 716	Estimating, Tendering and Contracting in Construction	None
CB 717	Project Planning and Control	None
CB 718	Financial Management in Construction	None
CB 719	Construction Economics and Feasibility Studies	None
CB 710-C	Construction Productivity	None
CB 711-C	Information Technology Applications in Construction	None
CB 712-C	Research Methods in Construction Engineering and Management	None
CB 713-C	Quality Management in Construction	None
CB 714-C	Strategic Management in Construction	None
CB 715-C	Risk Management in Construction	None
CB 716-C	Human Resources Management in Construction	None
Group II (1 Course)		
CB 723	Environmental Impact Assessment of Civil Engineering Projects	None
CB 731	Advanced Geotechnical Engineering	None
CB 740	Advanced Construction Materials	None
CB 746-S	Reliability in Civil Engineering	None
CB 753-T	Geographic Information Systems for Construction Engineering	None

Master's Thesis Research

Code	Title	Prerequisite
CB 701	Master's Thesis Part (I)	None
CB 702	Master's Thesis Part (II)	None

13 Loughborough University, UK

If you're a recent graduate from construction and related disciplines, our Construction Management MSc programme is designed for you; it introduces the fundamentals and challenges faced by contemporary construction management. It's also perfect if you have a strong technical background which you want to complement further with requisite management know-how – essential if you want to develop your national and international careers in the construction sector.
The modules on our Construction Management MSc programme are designed to deliver a high quality educational experience that develops and sustains your knowledge, skills and aspirations in the further advancement of your career within the construction industry.

13.1 Modules

Our Construction Management MSc course covers a wide range of topics; to give you a taster we have expanded on some of the core modules affiliated with this programme and the specific assessment methods associated with each module.

Compulsory modules

13.2 ICT for Construction Projects

This module provides students with the fundamentals of information and communication technologies in construction and their operation within construction organisations and projects. It covers Project information flows, e-business, database technologies, emerging technologies, building information modelling technologies, groupware and collaborative systems.

13.3 Research and Communication

This module are provides the student with an overview of sources of information in construction. It explains how to conduct a literature review and introduce students to the principal methods of investigation in construction research; and provide an opportunity for each student to develop professional and academic skills in oral and written communication.

13.4 Principles of Design and Construction

This module provides students with the fundamental principles of managing a project during the design and construction phases. It covers principles of design management, construction technology, estimating, planning, and health and safety.

13.5 Principles of Project Management

The aim of this module is to provide students with an understanding of construction project management principles and techniques. It includes material on Project Management Principles; Project Quality and Improvement; Construction Mega Projects; Understanding Project Failure; Investment Appraisal; Sensitivity and Risk Analysis; Corporate and Project Finance; Entrepreneurship, Motivation, Incentives, Behaviour and Leadership.

13.6 Postgraduate Research Project

This module is provideing the student with experience of the process and methodology of research by defining and studying (on an individual basis) a complex problem in a specialised area relating to their degree. Each student (supervised by an academic who is an expert in the field) writes a dissertation worth 60-credits.

Optional modules

13.7 Design Management

The aim of this module is to develop students' understanding of the principles of design management and techniques for cost and value management. It covers topics such as: Managing the design team; Value management; Briefing; Roles and workings of Conceptual, Schematic and Detail design phases; Process protocol; Process mapping techniques; Dependence structure matrix; Design economics.

13.8 Sustainability in the Built Environment

This module enables students to understand the principles and practice of sustainability issues as they relate to the built environment and its many stakeholders. It allows students to appreciate the application of a building sustainability assessment scheme, and specifically work towards becoming a BREEAM (Building Research Establishment Environmental Assessment Method) Accredited Graduate.

13.9 Management of Construction Processes

This module develops students' knowledge of cutting edge contemporary management concepts and innovations and how these contribute to successful construction projects. It covers Site strategy, risk management, innovation, building process, off-site production, and logistics.

13.10 Federated 3D Building Information Modelling (BIM)

The creation, deployment and use of aggregated and integrated (Level 2 and 3) models are key goals of collaboration through BIM. This module aims to deliver hands-on practical skills on the use of BIM technologies (i.e. design software and collaboration tools) for real-time collaboration of federated/aggregated 3D BIM models. The theories of group working; workspace awareness and shared situational awareness within design teams/processes will be explored.

13.11 Strategic Management in Construction

The aim of this module is to introduce the student to the fundamental concepts of strategic management and the tools for formulating and implementing strategies within the construction sector. This module will provide an introduction to Strategic Management within a construction context. This will involve the development of organisational plans, an Introduction to Strategic Management Concepts, Strategy Formation and Implementation,

External and Internal Environment Analysis, Financial Strategies, Decision and Analytical Tools, Corporate Strategic Events, Strategic Risk Management, Leadership and Decision-making (The role of team charters and framework agreements), Corporate Social Responsibility, Case Analysis of Corporate Strategy.

13.12 People and Teams

This module introduces students to the range of techniques and strategies for managing people and teams within the context of the construction sector, and enables students to apply this knowledge within individual and team-based exercises. Topics covered include: Challenges of managing people in construction; overview of organization and management theory; introduction to organizational behaviour (individuals and teams); motivation; leadership styles and skills; teamwork and team development; Human Recourse Management theory; strategic HRM approaches; conflict management; culture and ethics.

13.13 Procurement and Contract Procedure

The aims of this module are for the student to be introduced to and provided with an in-depth knowledge of current and emerging practices of the Quantity Surveyor in the following areas: (1) fulfilling client needs and ensuring that project criteria are satisfactorily achieved; (2) ensuring the validity of contract documentation; (3) management of the final account.