

Study Plan 2023

Courses Descriptions

INTRODUCTION TO DESIGN (3 Cr./H)

ARC110 Prerequisite None

This course aims to introduce students to the basic elements of design, its principles, and the perception and understanding of abstract composition within an analytical method. It aims also to bring an insight into concepts of architecture: space, form, enclosure and quality of space, principles of design like harmony, symmetry etc. and their application.

ARCHITECTURAL & INTERIOR GRAPHICS (3 Cr./H)

ARE 117 Prerequisite None

This course introduces students to technical drawing as means of professional engineering communication. It will cover the basic elements of drafting: line drawing, shape description, projections, drawing standards, sections, and dimensioning by applying both: Manual and Computer -aided drawings.

ENG. PHYSICS I (4 Cr./H)

PHY121 Prerequisite None

This course aims at developing a clear understanding of the basic concepts in physics. The course includes: physics and measurements, vectors, motion in one and two dimensions, Newton's laws of motion and their applications, work and energy, rotational dynamics, rolling motion, conservation of angular momentum with special emphasis on engineering applications.

ENGINEERING MATHEMATICS I (3 Cr./H)

MTH121 Prerequisite None

To introduce the basic concepts and develop the understanding of limits, continuity, derivatives, differentiability and integrability of functions of a single real variable, and their applications in engineering field.

ARCHITECTURAL DESIGN I (4 Cr./H)

ARC120 Prerequisite (ARC110) & (ARE117)

This course aims to introduce students to basic elements and principles of architectural design. Through a series of step-by-step exercises, students are invited to work on Theories of Proportion, Form and Space definition, spatial and functional relationships. Students, through the design of a small-scale project, will draw upon how to develop their architectural thinking and problem-solving skills. Beside understanding basic requirements of site, environmental, structural and social aspects

HISTORY OF ARCHITECTURE (3 Cr./H)

ARC121 Prerequisite None

This course introduces students to the development of Architecture from Ancient Civilizations till, and including, the Islamic period. The course involves a brief review of Early Historic, Classical Architecture; from Early Christian through Gothic architecture till the historic architecture of the Islamic world. Students will be taught about major features and design concepts that helped shape historic buildings of these ancient, classical

and medieval periods. A major concern of the course is the discussion of various themes, principles, theories, and terms needed to develop such architectural heritage. Students are given the knowledge and skills to analyze and assess building forms, design concepts/ elements, materials and techniques employed in those historic eras.

CHEMISTRY FOR ENGINEERS (3 Cr./H)

CHI101 Prerequisite None

This course aims to introduce students to electronic structure and the periodic table, types of bonds, chemistry of the metals and semiconductors, introduction to organic chemistry, alkenes and alkynes and polymer.

ENGINEERING PHYSICS II (4 Cr./H)

PHY122 Prerequisite PHY121

This course aims to introduce students to electric charge and electric field, capacitance, dc circuits, magnetic fields, electromagnetic induction, inductance, electromagnetic waves and the optics field.

ENGINEERING MATH II (3 Cr./H)

MTH122 Prerequisite MTH121

Matrix addition, subtraction, multiplication and transposition. Complex numbers, algebraic properties of complex numbers, absolute values, complex conjugate, polar representation, powers and roots. Functions of several variables. Double and triple integrals in rectangular and polar coordinates. Applications of multiple integrals in engineering. Infinite sequences, tests for convergence, power series expansion of functions, Taylor series, Laurent series, Fourier series and their applications in engineering

ARCHITECTURAL DESIGN II (4 Cr./H)

ARC210 Prerequisite ARC120

This is a studio course that introduces the strategies of architectural design. Students develop an architectural project based on a building program and site. Issues concerning building assemblies, structural systems, building envelope systems, and environmental systems are covered.

STATICS (3 Cr./H)

CIE211 Prerequisite PHY121

The course (Statics) introduces knowledge and understanding of vector resultant of forces in two and three dimensions; type of structural supports; equilibrium of particles and rigid bodies; analysis of internal forces in beams and trusses; static and kinetic friction; centroids of lines, areas and volumes; moments of inertia.

BUILDING INFORMATION MODELING (BIM) (3 Cr./H)

ARE253 Prerequisite ARE117

The use of Building Information Modeling (BIM) has caused a dramatic shift in design process; not only in the field of architecture, but in all other related industries. It represents a new method that step-by-step changes the way architects and designers think. Revit is one of the best BIM applications, which nowadays considered the number one application used all over the world. This software will offer students better chances to design more accurate and complicate buildings that can respond to the up-to-date requirements of the industry.

BUILDING CONSTRUCTION ENGINEERING (3 Cr./H)

ARE233 Prerequisite ARE117

This course introduces students to the basic concepts and properties of building structural systems, their components, and materials. Students will be able to analyze main stress directions and select a relevant structural system (short/ medium span) for the project at hand. In addition, the course will familiarize students with thermal and moisture protection in buildings; means of vertical circulation; enclosure systems (windows and doors), internal finishing materials (partitions, flooring, ceiling), and various finishing materials, their properties, and their means of application will be introduced.

ENGINEERING MATH III (3 Cr./H)

MHT221 Prerequisite MTH122

This course aims to introduce students to vector calculus, ordinary differential equations, Laplace transformation and partial differential equations.

CIVIL ENGINEERING MATERIALS (4 Cr./H)

CIE222 Prerequisite CHE101

To familiarize the students with different types and properties of various materials used in the civil engineering construction projects (such as cement, aggregate, asphalt cement). Familiarize the students with concrete and its constituents (cement, aggregates, water), cement manufacturing, cement hydration (physical and chemical properties), fresh and hardened concrete properties including tests for classifying fresh concrete (e.g. consistence), destructive tests for hardened concrete (e.g. compressive strength, tensile strength, etc.) Fresh and hardened concrete deformations, concrete durability, concrete curing, and concrete admixtures. Familiarize the students with asphalt cement and its types and characteristics, perform different tests on asphalt cement such as penetration, ductility, viscosity and specific gravity. Familiarize the students with aggregate types and characteristics and perform some tests on it to obtain its properties such as gradation and physical properties. Several types of other construction materials such as wood, steel and glass will be introduced.

MECHANICS OF MATERIALS (3 Cr./H)

CIE212 Prerequisite CIE211 & MTH122

Explanation of the response of engineering materials in terms of deformations when subjected to forces. Understanding the meaning of stress and strain terminologies. Formulation of relations between stresses, deformation, strains and applied forces. Using statics to analyses determinate beams. Understanding the internal forces developed in beams

GENERATIVE/PARAMETRIC DESIGN (3 Cr./H)

ARE254 Prerequisite ARE253

The main objective of the course is to help students gain the intellectual skills that are necessary within the realm of digital design practice in architecture. The ways of computational thinking will be introduced and experienced through exercises which focus on computational problem solving, cognitive models, generative systems, shape grammars, spatial configurations and design tool development. "Learning by doing" is a crucial approach for the course. Therefore, the course content will be performed through workshops and design assignments which will be worked by using and developing several types of design tools from manual to digital. By the end of this course students should be able to digitally fabricate their design and assemble them into physical models.

CONSTRUCTION METHODS AND EQUIPMENT (3 Cr./H)

ARE234 Prerequisite ARE233

This course provides students with a comprehensive background on building construction methods, processes and site equipment. The course is planned in two sections, first section will encompass the building construction phases related to site preparation and safety, dewatering, earthworks (excavation), foundations, forming substructure (plinth systems, sub floors and water storage tanks) and super structure (columns, building core, beams, RCC slabs, walls systems, roofs and overhead water storage systems). Whereas the second section of course focus on the role of machines and several types of construction equipment in execution of building construction. In addition, the practical part of course will help the student to produce the key details of building construction elements and layout drawings.

ENG. MATH IV (3 Cr./H)

MTH222 Prerequisite MTH221

Linear Algebra: Matrices and determinants, solution of systems of linear equations, eigenvalues and eigenvectors, engineering applications, computer exercises. Complex Analysis: Complex functions, derivative of complex functions, analytic functions, Cauchy-Riemann equations, harmonic functions. Fourier analysis: Fourier Series, Fourier Integrals, Fourier series of even and odd functions with applications.

STRUCTURAL ANALYSIS I (3 Cr./H)

CIE331 Prerequisite CIE212

Internal axial forces in the members of statically determinate trusses, deflections in beams and trusses, internal forces in three hinged arches, influence lines of statically determinate structures.

GEOTECHNICAL ENGINEERING, I (3 Cr./H)

CIE361 Prerequisite CIE212 & CIE222

Soil formation, composition types, physical properties of soils, soil classification and testing. Flow of water through soil, soil analysis and site investigation to determine the properties of soils and their bearing capacity; distribution of stresses in soils and the potential for differential settlement; soil classification factors to be considered in foundation design, lateral earth pressure and retaining walls, water flow in soils, soil compaction, consolidation and consolidation settlement, shear strength of soils, and slope stability.

ENGINEERING MECHANICS - DYNAMICS (3 Cr./H)

MEC205 Prerequisite CIE211

Fundamental concepts of kinematics and kinetics with application to motion of particles and plane motion of rigid bodies, rectilinear and curvilinear motion, Newton's second law, impulse and momentum methods, impact, dynamics of systems of particles, kinematics of rigid bodies; plane motion of rigid bodies, forces and accelerations, energy and momentum methods.

SUSTAINABLE ARCHITECTURE (3 Cr./H)

ARC373 Prerequisite PHY121

This course aims to introduce students to basic concepts of sustainable design and its application in architecture considering environment and quality of space. The course provides students with a thorough understanding of the nature and scope and components of sustainable architectural design, passive design solutions and water consumption, and recycling beside renewable and nonrenewable energy. Students will be able to select best forms and smart construction materials for design in different regions to produce sustainable buildings and reduce energy use. Students also will be get acquainted with relevant computer applications used in sustainable design, analysis and calculations of energy use in buildings.

DESIGN OF REINFORCED CONCRETE STRUCTURES (3 Cr./H)

CIE334 Prerequisite CIE331 & CIE222

Introduction to building in “reinforced concrete”. Introduction to the behavior of reinforced concrete sections, reinforced concrete members & reinforced concrete frames. Introduction to international codes of practice for the design of reinforced concrete buildings. A computer application on structural analysis and reinforced concrete design of various structural elements. A suitable software will be chosen for this purpose (such as STAAD PRO or ETABS).

ADVANCED BUILDING CONSTRUCTION TECHNOLOGY (3 Cr./H)

ARE331 Prerequisite ARE234

This course aims to introduce students to advanced building construction systems & technologies and the means of deploying them in buildings. The first part of the course deals with long-span structures, building envelopes, modular construction, advanced building construction technology, advanced façades construction, sustainable materials, mechanization, and robotics. While the second part of the course discusses the use of Virtual Reality (VR) & Building Information Modeling (BIM) in construction visualization. The practical part of the course will assist students in using BIM & VR tools to produce and visualize a building construction System.

BUILDING MECHANICAL SYSTEMS (3 Cr./H)

ARE374 Prerequisite PHY121

This course aims to introduce students to basic concepts of basic building mechanical service systems in the form of air conditioning, water supply, and sewage. Their design and applications, and how to design buildings that need less of both resources. The UAE uses up to 80% of its electricity consumption on air conditioning and it has few natural freshwater resources. The student is guided on how to design buildings that can reduce the consumption of both.

ARCHITECTURAL ENGINEERING TRAINING I (1 Cr./H)

ARE351 Prerequisite Year 3 & ARE331

This course introduces students to the construction/construction management aspects of Architectural Engineering practice, office work, and construction sites.

ARCHITECTURAL ENGINEERING DESIGN (3 Cr./H)

ARE300 Prerequisite ARC210 & CIE334

This course aims at developing students' analytical skills and awareness of the building physical form and context of mixed-use building. Students are introduced to the engineering design process, as well as assessment and application of selected structural systems, building structural design, building codes, design for safety in buildings, architectural expression using appropriate architectural presentation techniques.

DESIGN OF STEEL STRUCTURES (3 Cr./H)

CIE431 Prerequisite CIE331

Introduction to steel structures and practical design methods. Steel sections. Load factors and load combinations. Design of various steel elements using LRFD-method. Design of tension and compression members, Elastic and inelastic stiffness of columns. Beam design: Compact section criterion, lateral-torsional buckling, lateral supports, and various design aspects of beams. Design of steel members subject to biaxial moments. Design of simple bolted (or welded) steel connections. A software will be used for steel analysis and design.

CONSTRUCTION PROJECT MANAGEMENT (3 Cr./H)

ARE532 Prerequisite ARE331

This course provides students with a comprehensive understanding of project management principles and techniques. The in-depth study prepares students to apply various aspects of project management for construction projects. Topics include Project life cycle & Stakeholders, planning and scheduling, resources management, quality management, risk management, contracting and delivery methods, and internet impact on project management.

ENGINEERING ECONOMICS (3 Cr./H)

CIE371 Prerequisite STA114 & MTH122

Introduction to microeconomics, competition and monopoly, labor markets, macroeconomics, world trade and the balance of payments, basics of financial accounting and project appraisal and economic feasibility of engineering projects, income measurement, capital investments, equipment alternative analysis and equipment replacement studies.

ADVANCED CONSTRUCTION PROJECT MANAGEMENT (3 Cr./H)

ARE533 Prerequisite ARE532

This course provides students with the knowledge and skills required to effectively plan, schedule, and control construction projects. Topics include communication & human resources management, advanced scheduling techniques; risk and uncertainty impact on time and cost parameters, resource allocation and leveling; cash flow; progress monitoring and control using earned value analysis; schedule crashing, and time cost trade-off. In addition, the course covers other essential topics, such as Conflict and claim management, as well as 4D & 5D Modeling in construction planning & scheduling.

LIGHTING AND ACOUSTICS IN ARCH. (3Cr./H)

ARE472 Prerequisite PHY122

This course aims to familiarize students with basic principles and means of the Design and Measurement of Lighting and Acoustics in Architecture, as well as its Impact on the Environment.

BUILDING ELECTRICAL SYSTEMS (2 Cr./H)

ARE473 Prerequisite PHY122

This course covers fundamentals for circuit design analysis; alternatives for circuit design, resonance and quality factors, mathematical and physical models and analysis techniques required for building applications. Estimating electrical loads for lighting and equipment, specification and selection of equipment and electric fixtures, distribution and developing wiring diagrams.

ARCHITECTURAL ENGINEERING TRAINING II (1 Cr./H)

ARE352 Prerequisite Year 4 & ARE351

This course introduces students to the construction/construction management aspects of Architectural Engineering practice, office work, and construction sites.

GRADUATION PROJECT I (3 Cr./H)

ARE500 Prerequisite ARE300

This course is considered the first stage leading to developing an Architectural Engineering Design Project through designing, prototyping, testing, and implementing different engineering solutions to typical engineering problems. The course starts by investigating through research, data gathering, and analysis to develop initial conceptual design alternatives to respond to engineering problems. Following that, different alternatives will be evaluated, and finally, a formal preliminary written report is required along with visual

presentation materials for the developed architectural engineering solutions. This course is considered the first stage leading to the Graduation Project II course.

PROFESSIONAL PRACTICE, SPECIFICATIONS & COST ESTIMATION (3 Cr./H)

ARE530 Prerequisite ARE331

This course aims to provide students with knowledge and skills of professional practices and cost estimating in construction, according to the code of conduct. In addition, the course introducing the principles and theories of preparing Specifications and Bill of Quantities documents for construction projects and explore a range of legal, ethical, and professional practice for construction.

GRADUATION PROJECT II (3 Cr./H)

ARE501 Prerequisite ARE500

This course is considered the second stage leading to develop an Architectural Engineering Design Project through designing, prototyping, testing and implementing different engineering solutions to typical engineering problems. The course focuses on investigating social, ethical and environmental impact on developed engineering solutions; develop detail construction/construction management systems; building construction detailing and specifications; construction testing and performance verifications; cost, time and resources management. In addition, simulate time and cost benefits using 4D & 5D applications. A final written report is required along with visual presentation materials for the developed architectural engineering solutions.

SELECTED TOPICS IN ARCHITECTURAL ENGINEERING (3 Cr./H)

ARE580 Prerequisite Year 4

This course introduces students to how to discuss and trigger the most important issues vital to their academic and professional development. It helps them organize their thoughts and interests in a systematic way in relation to their architectural Engineering education. The course also enables students to express various progress in architectural Engineering education of a special field both orally, by writing and graphically.

REAL ESTATE DEVELOPMENT (3 Cr./H)

Prerequisite Year 4

The course introduces students to basic concepts and theories of Real Estate Development and Management, including property valuation and identifying opportunities in real estate projects. Specific topics cover different aspects of residential, office, and retail real estate types and the main stages in the process, including idea conception, feasibility, planning, financing, market analysis, contract negotiation, construction, marketing, and asset management.

RESEARCH AND DESIGN METHODS (3 Cr./H) ARC582

ARC585 Prerequisite Year 4

This course aims to introduce students to basic theories, concepts and methods of scientific research and their relevance to architectural design and programming. In this course students will learn, in brief, how to conduct scientific architectural research, starting with how to employ methods of data collection and analysis to inform all aspects of the programming and design process, and ending with making a comprehensive analysis and evaluation of a building, building complex, or urban space.

LEGAL ISSUES IN CONSTRUCTION LAWS (3 Cr./H)

ARE421 Prerequisite ARE532 & Year 4

This course will encompass the issues of construction legislation with special emphasis on the construction contracts, theory and practice of negotiations, mediation, contract administration, and arbitration. Review of types of construction contracts, discussion of future trends. Legal concepts and processes applicable to the development of constructed facilities and to the operation of the construction firm, emphasis on UAE law and institutions.

STRUCTURAL ANALYSIS II (3 Cr./H)

CIE332 Prerequisite CIE331 & Year 4

Determinacy and indeterminacy of structures. Stability of structural systems. Methods for solving indeterminate structures. Shear force, bending moment and elastic lines diagrams. Use of models to analyze structures.

CONSTRUCTION ESTIMATION (3 Cr./H)

ARE420 Prerequisite ARE532 & Year 4

This course will encompass the techniques and procedures used for estimating the cost of construction projects. Cost estimation process; elements of the project cost; conceptual and detailed cost estimation methods; risk assessment and range estimating; case studies; computer-aided estimating. Particularly a focus on concrete foundation-related work, earthwork, masonry, above-grade concrete, concrete frame, and structural steelwork items

SPECIFICATION AND QUANTITY SURVEYING (3 Cr./H)

CIE471 Prerequisite ARE331 & Year 4

Introduction; types and documents of tenders; types of construction contracts; bonds and insurance requirements; local and International general conditions and obligations of construction contracts; preparation of specifications; regulations pertinent to buildings, construction works and building materials; quantity surveying and bill of quantities; rights and obligations of engineering consulting offices. Study of estimating and costing of civil engineering projects. Cost estimation process. Elements of the project costs. Case studies. BIM software will be used for estimating at different phases of construction.

SURVEYING I (3 Cr./H)

CIE241 Prerequisite MTH121

Errors in measurements. Horizontal and vertical distance measurements, leveling / topographical and terrain elevations changes, topographic surveys, using topographical surveys to calculate areas and volumes; Setting out horizontal and vertical control benchmarks and use of surveying equipment such as Levels and Theodolites.

WORKING DRAWING & CONSTRUCTION DETAILS (3 Cr./H)

ARE333 Prerequisite ARE331

Introduce students to basic skills and concepts of architectural working drawings and construction details, and the selection of suitable finishing materials related to function; Students will learn the basic language of the architectural drafting and understand the process of producing a set of architectural drawings, and how to produce detailed drawings and material specifications for the architectural engineering projects, applying local building codes, regulations and international standards.