Plan of Study: Bachelor of Architectural Engineering

Year I		
Fall Semester		**15 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 101	Architectural Drawing I	3
ENGL 101	Basic Academic English I	3
ARAB 101	Academic Writing in Arabic	3
MATH 199	Calculus I	3
PHYS 170	Fundamentals of Physics I	3
Spring Semester		**15 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 111	Architectural Drawing II	3
ARCH 102	Introduction to Architectural Building Science and Engineering Ethics	3
CIVE 210A	Mechanical Statics for Architectural Engineers	3
ENGL 102E	English for Engineering and Siences	3
CMPS 100B	Introduction to Technical Computing for the Sciences	3
Summer Semester		**9 Credits**
Code	**Course Title**	**Credit Hours**
ENGL 203E	English for Engineering and Science II	3
MATH 200	Calculus II	3
SOCS 102	Omani Society	3
Year II		
Fall Semester		**16 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 201	Architectural Design I	3
ARCH 202	Introduction to Computer Aided Drawing	3
MECH 270A	Properties of Materials for Architectural Engineers	3
CIVE 213A	Strength of Materials for Architectural Engineers	3
CIVE 265A	Surveying & GPS for Architectural Engineers	3
CIVE 265L	Surveying & GPS Laboratory	1
Spring Semester		**16 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 211	Architectural Design II	3
ARCH 212	Introduction to Building Information Modeling for Architects	3
EECE 210	Electrical Circuits (I)	3
CIVE 221A	Construction Materials for Architectural Engineers	3
CIVE 221L	Construction Materials Laboratory	1
MATH 205	Calculus III	3
Summer Semester		**9 Credits**
Code	**Course Title**	**Credit Hours**
MATH 221	Differential Equations	3
ENTR 200	Entrepreneurship: Innovation and Creativity	3
ENGL 204	Advanced English for Academic Purposes and Research	3
Year III		
Fall Semester		**14 Credits**
Code	**Course Title**	**Credit Hours**

ARCH 301	Architectural Design III	3
ARCH 302	Advanced Architectural Design Theories	3
ARCH 303	Building Construction I - Concrete Design	3
ARCH 304	Building Construction Methods	3
ARCH 306	History of Architecture I	2
Spring Semester		**15 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 311	Architectural Design IV	4
ARCH 313	Building Constructions II - Wood and Masonry Constructions Design	3
ARCH 305	Ecology and Building Environmental Control Systems I	3
ARCH 316	History of Architecture II	2
ENGR 300	Engineering Economy	3
Summer Semester		**3 Credits**
Code	**Course Title**	**Credit Hours**
ENGL 305	Advanced English Language and Communication Skills	3
Year IV		
Fall Semester		**15 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 404	Architectural Design V	4
ARCH 405	Ecology and Building Environmental Control Systems II	3
ARCH 403	Building Constructions III - Steel and Glass Design	3
ARCH 407	Sustainable Architectural Design	2
CIVE 480	Construction Management	3
Spring Semester		**12 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 401	Final Project I	3
ARCH 408	Working Drawings	3
ARCH 415	Building Lighting and Acoustical Design	3
XXX	Science Elective	3
Summer Semester		**0**
Code	**Course Title**	**Credit Hours**
ARCH 400	Approved Professional Experience	0
Fall Semester		**11 Credits**
Code	**Course Title**	**Credit Hours**
ARCH 402	Final Project II	3
ARCH 506	Construction Projects Specification and Quantities	2
ARCH XXX	Major Elective	3
ARCH XXX	Major Elective	3

Course Description

ARCH 101 Architectural Drawing I (3 crs/4 contact)

Aiming to provide students with architectural hand drawing and presentation skills the course includes line, scale and dimensions, free hand drawing, shapes and forms, tones and textures, shading technique, lettering and orthographic projections. Three dimensional isometric projections are introduced as well. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments for architectural drawing.

ARCH 102 Introduction to the Architectural Building Science & Engineering Ethics (3 crs)

Attitude to the building Science and Architectural Engineering as profession and the concepts of Engineering Ethics are introduced. Buildings systems and human being needs for comfort are studied. Architectural design as a process is introduced where the subjects such as building site, area, volume, necessity of fresh air, light, temperature, sunlight, and view are considered. The class in composed of theoretical modules and includes home works, presentations, quizzes, and exams.

ARCH 111 Architectural Drawing II (3 crs/4 contact)

Aiming to provide students with architectural hand drawing skills the course includes line, scale and dimensions, lettering, orthographic and three-dimensional drawings as well as floor plans, sections and graphic diagrams. Symbols and standards are introduced for facilitating the students to read architectural and engineering drawings. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments for architectural drawing. Prerequisite: ARCH 101.

ARCH 201 Architectural Design I (3 crs/6 contact)

Introduction to architectural design process through simple projects than provide understanding of place, order, context, form, aesthetic, and function. Project phases such as programming and concept development are presented. Meaning of project site, contextual constrains, building materials and structural aspects are introduced for developing a complete drawing set for architectural design projects. Introduction to the building design philosophy is provided. The class is studio based and includes class/home projects for architectural design development. Prerequisite: ARCH 102; ARCH 111

ARCH 202 Introduction to Computer Aided Drawing (3 crs/4 contact)

The course introduces computer as tool in architectural projects production with emphasis in AutoCAD program. Study procedures of computer drawing and graphics for producing 2D buildings plans, section and elevations; threedimensional building model. Skills such as computer drafting in 2D and 3D, image processing, rendering and plotting are obtained through series of assignments. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments for computer aided drawing. Prerequisite: ARCH 111; CMPS 100B.

ARCH 211 Architectural Design II (3 crs/6 contact)

Research, theory and field studies generate solving architectural design problems associated with client's needs. The concept of project brief is presented. The course develops ability of function, environment, climate, culture, and construction materials and systems integration within the project. Horizontal and vertical communication within the building is introduced. Simple but complex projects contribute to the progress of project visualization. The class is studio based and includes class/home projects for architectural design development. Prerequisite: ARCH 201.

ARCH 212 Introduction to BIM Architecture (3 crs/4 contact)

The course provides students with computer drafting skills enhancement and understanding of methods for BIM generating. Students obtain necessary abilities for construction drawings production. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments for building modelling. Prerequisites: ARCH 202.

ARCH 301 Architectural Design III (3 crs/6 contact)

The complex nature of architectural projects is understood. The course provides knowledge in urban context analysis

for developing design criteria of intervention strategies, evaluation of alternatives and selecting final design solution. Projects' contextual constrains and construction documentation phase are introduced. The class is studio based and includes class/home projects for architectural design development. Prerequisite: ARCH 211; ARCH 212.

ARCH 302 Advanced Architectural Design Theories (3 crs)

Course examines design theory as a means to develop cognitive and problem solving skills. Difference between theory and design theory of architecture is explored. Also explored are issues of order and organization, phenomena of perception, elements and organizing principles of form and space, ordering principles, design typology, designers and design thinking, and design process. The course provides comprehensive knowledge in buildings of different scale and function architectural design requirements. The class is composed of theoretical modules and includes lectures, home works, presentations, quizzes, and exams. Prerequisite: ARCH 211.

ARCH 303 Building Construction I – Concrete Design (3 crs/4 contact)

Structural principles and requirements in concrete design are studied. Primary and secondary loads, loads combination, static of structural elements, design of foundations, columns, beams, slabs and stairs, and deflections and cracks are emphasized. Structural calculations, construction methods in concrete work are highlighted. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisite: ARCH 212; CIVE 221A.

ARCH 304 Building Construction Methods (3 crs/4 contact)

This course concentrates in building construction methods including ecological. Types of buildings' structures and their construction methods and techniques are studied. Foundation, floor, wall and roof systems, moisture and thermal protection, building details, building joints and movements and pre-fabricating techniques are emphasized. Construction techniques of special form: dome, vault, shell, space frame and metal structure. The role of architectural engineer in construction supervision, its duties and responsibilities are studied. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisites: ARCH 211; CIVE 221A.

ARCH 305 Ecology and Building Environmental Control Systems I (3 crs/4 contact)

This course provides students with basic principles and application of Environmental Control Systems involved in buildings impacting its physical, structural, and functional dimensions as well as performance. Systems integration into building envelope, their impact on building performance, selection criteria based on sustainable design principles is understood. Plumbing and sanitary (water supply and distribution, sanitary including drainage, plumbing design and drawing), electrical (electrical safety, electrical distribution and circuit design, wiring, and electrical drawing) and safety system (fire safety design and drawing) are studied detailed. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisite: ARCH 212; ARCH 302.

ARCH 306 History of Architecture I (2 crs)

Architecture chronological evolution from the prehistoric period, through ancient to early Christian, Gothic, Renaissance, Baroque, and Industrial Revolution to the Modern movements is briefly studied. Vernacular architecture, buildings types and construction methods of the region are comprehended. The class is composed of theoretical modules and includes lectures, home works, presentations, quizzes, and exams. Prerequisite: ARCH 211.

ARCH 311 Architectural Design IV (4 crs/8 contact)

Production of construction drawings used in building industry is introduced. Knowledge in construction drawings content including structure, floor plans, elevation and sections, roof and site plans, walls, floors, roof sections and details, interior finishes elevation and details, schedules of building elements (windows, doors and other) and finishes and other are studied. Students drawing skills are developed for full set of construction drawings production. The class is studio based and includes class/home projects for architectural design development. Prerequisites: ARCH 301.

ARCH 313 Building Constructions II - Wood and Masonry Constructions Design (3 crs/4 contact)

Structural principles and requirements in wooden constructions are studied. Building assemblies, members and joints are considered. Masonry work, types and applications in buildings are comprehended. Materials employed in masonry constructions are highlighted. Both wood and masonry structural calculations, construction methods are emphasized. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Pre-requisite: ARCH 303.

ARCH 316 History of Architecture II (2 crs)

Islamic architecture chronological development from Umayyad in Syria and Iraq through classical periods in Spain, North Africa, Middle East, Fatimad, Ayyubid, Mamluk to the Ottoman period is studied. Distinctive Islamic features and Islamic architecture influence on other architectural styles are comprehended. Emphasis on contemporary region architecture is made. The class is composed of theoretical modules and includes lectures, home works, presentations, quizzes, and exams. Prerequisite: ARCH 306.

ARCH 400 Approved Professional Experience (0 crs)

Bachelor students are required to undergo eight-week of on-the-job experience with an approved professional firm. Prerequisite: ARCH 404.

ARCH 401 Final Project I (3 crs/1contact)

The first part of the final project which is research oriented is aimed to develop a comprehensive architectural solution that serves the society. Starts with project topic selection, programming studies, site selection, and ends with a research report completion. This part will consider general requirements for structural, environmental, and building services. Focus in assessment is on the architectural solution. Each student prepares an individual program for this course, concluding with a formal and bound document. The students work individually on research under the supervision of the instructor. Prerequisite: ARCH 404.

ARCH 402 Final Project II (3 crs/1contact)

Involves individual projects design resolution based upon the solutions and findings initiated in ARCH 404. It focuses on integrating the structural and building system designs with the previously accomplished architectural design in part one. The first phase of the course is devoted to design structural and services systems and preparation of related working drawing. The project encompasses all phases including working drawings and specifications preparation. The final project is developed under the guidance and advice of a faculty supervisor and is presented and defended in a formal public jury. Prerequisite: ARCH 401.

ARCH 403 Building Constructions III - Steel and Glass Design (3 crs/4contact)

The course concentrates on steel constructions structural principles and constrains. Types of steel structural members, assemblies and joints are studied. The applications of glass in building construction including curtain walls are highlighted. Both steel and glass structural calculations, construction methods are emphasized. The class will include hands-on applications, exercises, home works, quizzes, and exams. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisite: ARCH 313.

ARCH 404 Architectural Design V (4 crs/8 contact)

Last project phase – project implementation is introduced and the entire process of architectural design is understood. Studio explores design at the scale of the urban context. Scope covers design of architectural elements and their situation in the urban context. Attention is paid to contextual issues, such as site, location, and climate. Social, cultural and behavioral issues are also addressed. Commercial factors influencing projects are introduced. The class is studio based and includes class/home projects for architectural design development. Prerequisite: ARCH 311.

ARCH 405 Ecology and Building Environmental Control Systems II (3 crs/4contact)

The course provides knowledge in Heating, Ventilating, and Air-conditioning systems' types. Systems selection criteria based on sustainable and ecological design is studied. Comprehension of systems performance and total building management system is offered. HVAC systems technology, equipment and calculations, design thermal load

calculations, air distribution and duct design and sizing, and central refrigeration systems are studied. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisites: ARCH 305.

ARCH 407 Sustainable Architectural Design (2 crs/3 contacts)

Sustainability in building design is introduced and environmental factors impact on design process is studied. This course accents on indoor thermal comfort provision by considering comfort zones, site location, climate, solar geometry, shading and radiation, wind speed and direction. Alternative sources of energy for buildings operation and green buildings are also comprehended. The class is a combination of lecture (1) and practical modules (1) and includes theory, exercises, tools and class/home assignments, projects for architectural drawing. Prerequisite: ARCH 302.

ARCH 408 Working Drawings (3 crs/4contact)

Production of construction drawings used in building industry is introduced. Knowledge in construction drawings content including structure, floor plans, elevation and sections, roof and site plans, walls, floors, roof sections and details, interior finishes elevation and details, schedules of building elements (windows, doors and other) and finishes and other are studied. Students drawing skills are developed for full set of construction drawings production. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisites: ARCH 404.

ARCH 415 Building Lighting and Acoustical Design (3 crs/4 contact)

Electrical and natural light sources are studied. Lighting design process steps are enlightened. Quality and quantity of illumination, calculation, selection and positioning of light sources is emphasized. Acoustical considerations in architectural design are highlighted. Acoustical properties of materials and room shapes, sound absorption and transmission, noise control and materials selection are understood. The class is a combination of lecture (2) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisite: ARCH 405.

ARCH 506 Construction Projects Specification and Quantities (2 crs/3 contact)

Contract documents, divisions of specifications, types of specifications, technical divisions options and alternatives, contracts, time and money, changes bonds liens, government contracts, general conditions, special conditions, proposal form, instruction to bidders, invitations to bid, checking, interpretation of specifications, and computerized specifications. Local standard public works contract. The class is a combination of lecture (1) and practical modules (1) and includes theory, exercises, tools and class/home assignments, and projects. Prerequisite: ARCH 408.

CIVE 210A Mechanical Statics for Architectural Engineers (3 crs)

This course covers the following topics: force vector, 2-D system of vectors, moment, couple, resultants, static equilibrium of 2-D forces and moments, centroid, truss, friction. Prerequisite: PHYS 170.

CIVE 213A Strength of Materials for Architectural Engineers (3 crs)

This course covers five sections. 1) Lathe - machine components and different operations; 2) Basic principles of arc (AC and DC) and gas welding; 3) machine-shop, basic principle of milling, grinding, and drilling machines; 4) soldering of electronic components, and 5) electric wiring. The class is composed of theoretical modules and includes lectures, home works, presentations, quizzes, and exams. Prerequisite: CIVE 210A.

CIVE 221A Construction Materials Lab (1 crs)

The Construction Materials Laboratory is established to train students to carry out tests on common construction materials such as concrete, steel, wood, and masonry. The tests are conducted to determine the engineering properties in terms of strength, strain, fatigue, creep, elasticity, stiffness durability, and workability. Prerequisite: CIVE 213A.

CIVE 221L Construction Materials for Architectural Engineers (3 crs)

This course covers the composition and properties of engineering construction materials through hands-on laboratory experiments. The course introduces students to developments in construction equipment and

technologies and Includes field demonstrations. The class is composed of theoretical modules and includes lectures, home works, presentations, quizzes, and exams. Prerequisite: CIVE 213A.

CIVE 265A Surveying and GPS for Architectural Engineers (3 crs)

This course deals with the theory of measurements and errors; linear measurements; surveying instruments; leveling; angles, bearings, and azimuths; stadia measurements; traversing–field aspects; traverse computations and adjustment; topographic surveying; triangulation. Prerequisite: MATH 200; ARCH 102.

CIVE 265L Surveying and GPS Lab (1 crs)

In the Surveying Laboratory, students learn how to conduct distance measurements, transits and theodolites, vertical control, directions, angular measurement, topographic surveys, area and volume of earthworks, curve setting out, planimetric adjustment, GPS observable; basic principles of GPS operations; GPS error analysis; field procedures; data collection, processing; applications. Prerequisites: MATH 200, ARCH 102.

MECH 270A Properties of Materials for Architectural Engineers (3 crs)

This course covers the different types of materials: metals, ceramics, polymers; type of bonds: Ionic, covalent and metallic bonds; unit cells and crystal structures, points, directions and planes within a unit cell; mechanical properties of materials: strength, toughness, ductility, resilience; failure: fatigue, creep. Thermal properties of materials: heat capacity, thermal expansion, thermal conductivity. Prerequisite: ARCH 102.

CIVE 480 Construction Management (3 crs)

This course examines the quality and treatment methods of water and wastewater; testing for physical, chemical, and biological parameters. Prerequisite: ARCH 304.

ARCH 321 Advanced BIM for Architecture (3 crs/4 contacts)

The course provides students with computer advanced skills enhancement and methods for BIM generating. Students obtain necessary abilities buildings structural and environmental systems and materials integration into construction drawings production. Pre-requisite: ARCH 212.

ARCH 322 Modelling and Rendering (3 crs/4 contacts)

Rationalized, geometrical approach to the perception and description of form. Selected examples of architectural form are first rigorously analyzed to re-derive their constructional logic and then are “built” as detailed electronic models. Students explore the potential of digital design technologies as instruments to achieve vivid, authentic, holistic simulations of architectural reality, appropriate to the testing of architectural ideas. Taught in a modified studio format. Pre-requisite: ARCH 202.

ARCH 323 Ecological Building Materials (3 crs)

The course introduces to the students the large range of ecological materials used in building industry. The appreciation of materials impact on environment and indoor air quality is comprehended. The understanding of materials and finishes selection criteria and usage of them based on analyses of human factors will be introduced. The importance of using local materials as well as considering local market availability will be studied. Pre-requisite: CIVE 221.

ARCH 324 Local Vernacular Architecture, Construction Materials, Methods and Craftworks (3 crs)

The course provides knowledge on local vernacular architecture, construction materials and methods. The recognition of vernacular architecture effect on modern design methods and buildings features is comprehended. Pre-requisite: ARCH 306.

ARCH 421 Special Topics in Interior Architecture (1 crs)

This independent course will cover a particular topic suggested by a faculty member in the program and conducted by a student having the required pre-requisites. Pre-requisite: Permission of the Instructor, and approval of the Department.

ARCH 422 Green Buildings (Codes, Standards and Rating Systems) (3 crs)

The course provides knowledge in International Green Construction Code, ASHRAE 189.1 Standard for the Design of High-Performance Green Buildings, Green Building Assessment Protocol (ANSI/GBI01-2010) and LEED. It will examine site development and land use, material resource conservation, energy efficiency, water resource conservation, indoor environmental quality, building commissioning, operations, and maintenance. Pre-requisite: ARCH 311.

ARCH 423 Bio-climatic Integration into Architecture Context (2 crs)

The course provides theoretical and practical skills in bio-climatic design and is composed of two modules: Outdoor/indoor comfort and natural ventilation assessment. The outdoor and indoor comfort module determines the areas of possible wind discomfort to make spaces more pleasant and safer for its users. The natural ventilation module estimates and optimizes natural ventilation of buildings and evaluates the indoor comfort and air quality. Pre-requisite: ARCH 315.

ARCH 424 Identification and Evaluation of the Historic Built Environment (3 crs)

Methods, techniques and theories of researching, analyzing, documenting and evaluating the historic built environment. Includes architectural survey field methods, documentation techniques, archival research and approaches to evaluating historic significance. Pre-requisite: ARCH 306.

ARCH 425 Environmental Design Research (2 crs)

Advanced skills for identifying research questions and methods for accomplishing research in the environmental field. Design research project is planned. Emphasis on research process including problem identification, literature review, data collection and analysis. Pre-requisite: ARCH 311.

ARCH 426 Human Factors (2 crs)

The psychology of the client or user is a crucial factor influencing the design of the environment and the practice of interior architecture. Facts will be gathered about the interaction of the environment and user's culture, gender, stage of life cycle and physical characteristics. Pre-requisite: ARCH 405.