PE 217 Material Science **3[3-0-2]**

Classification of engineering materials, atomic and molecular structure, bonding and coordination. Properties relationship in materials (metals, ceramic glasses and polymers). Corrosion resistant materials, composites and their applications. Testing of materials and selection factors for various applications. The course will focus on polymer properties and modification for special applications. The lab will concentrate on sample preparation and testing effect of service conditions on the properties of materials, properties of alloys and composites

Prerequisite: BE121

PE 218 Mechanics of Materials and Mechanical Design **3[3-2-0]**

Properties of materials, simple stresses, Principle stresses, deflection and stiffness of mechanical members, pressure vessels, seals, design of shafts. Drives (gears, robes, belts and chains). Sliding and anti-friction bearings.

Prerequisite: PE 217

PE 220 Chemical Engineering Thermodynamics II **4 [3-2-1]**

Application of second law of thermodynamics in Chemical Engineering, the heat effects, vapour liquid equilibrium, Thermodynamics of mixtures chemical reaction equilibrium. Phase rule, solid-liquid equilibrium, solid-gas equilibrium ,gas-liquid equilibrium, Ideal mixtures, Two compound systems (binary).Cycles and thermodynamics properties relations.

Prerequisite: PE 200

PE 231 Heat Transfer in Chemical Process **4[3-2-2]**

Heat conduction, convection and radiation (for steady and unsteady states) and its application in chemical operations, extended surfaces, thermal boundary layer and turbulence. Heat transfer inside pipes and outside geometries, heat transfer in packed beds and chemical reactors, boiling, condensation, Heat exchangers.

Prerequisite: BE 121and BE 102

PE 313 Mass Transfer **3[3-2-0]**

Molecular mass transfer, Estimation and measurement of diffusion coefficient, analogies among mass, heat and momentum transfer in turbulent flow, Interphase mass transfer, continuous two-phase transport, absorption and drying.

Prerequisite: PE 231

PE 314 Instrumental Analysis 3[2-0-3]

Introduction to spectroscopic and spectrophotometer analysis – ultraviolet spectrophotometer – molecular fluorescent spectrophotometer– Introduction to chromatographic analysis –Gas and liquid chromatography – sample preparation – Experimental work : introduction to techniques and instruments used in modern chemical research.

Prerequisite: PE 214

PE 315 Physical Chemistry 3[3-0-2]

Reaction rates, kinetic theory of interfacial gas chemistry, adsorption of gases and liquids. Colloidal Systems, emulsion polymers and fine liquid droplets are covered. Chemical equilibria and effect of temperate and pressure on equilibrium constant

Prerequisite: BE131

PE 317 Unit Operations 4[3-2-2]

Distillation, liquid-liquid extraction and leaching, humidification and crystallization mechanical separation processes (filtration, sedimentation, centrifugation, gas cleaning).

Prerequisite: PE 313

PE 318 Industrial Corrosion 3[3-0-1]

Types of Corrosion and mechanisms, corrosion monitoring and detection, metallurgical aspects of corrosion and material selection, corrosion prevention and control.

Prerequisite: BE131

PE 320 Automatic Process Control 3[3-2-0]

Theoretical bases of automatic control analysis and design of chemical Process control systems, control aspects of chemical Process, Linear open- loop systems linear closed –loop systems frequency response process application, computer in Process control.

Prerequisite: BE204

PE 321 Computer Applications in Chemical Process Engineering 2[2-2-0]

Flow sheeting applications of special Computer programming to design equipment and chemical reactors, and also to study mass and heat transfer. Process synthesis using computer software application of simulators for process design.

Prerequisite: PE231

PE 324 Gas Treatment and Liquefaction **4[4-1-0]**

Characterization of natural gas systems. Qualitative phase behavior of natural gas systems. Separators design and selection. Mercury removal, water-hydrocarbon system-hydrate formation, inhibition dehydration, and glycol dehydration .Sweetening equipment sizing, selection and design. Fundamental of gas liquefaction and liquefaction cycles : houle –Thompson, turbine expansions and external refrigeration .Hydrocarbon recovery units, materials equipment performance and selection, natural gas liquefaction plants, LNG storage and degasification plants.

Prerequisite: PE213 and PE 214

PE 326 Gas Storage and Transportation **3[3-0-0]**

Design theory and methods of production and measurement of natural gas. Transportation, transmission, storage and distribution pipeline network.

Prerequisite: PE324

PE 327 Chemical Process Principles **4[4-4-0]**

Fundamentals of material balance calculations, Batch and continuous, steady flow and unsteady process, reactive and non reactive systems for single unit and multi unit process, process with recycle and by-pass with or without purge. It also covers, material balance for Combustion reactions, single phase systems, multiphase systems degrees of freedom analysis. Energy balance on closed and open system, the steady flow energy equation tables of thermodynamic data, Energy balance on non reactive process, state properties and hypothetical process paths employed for their estimations , Energy balance for mixing and dissolution process , Energy balance on reactive process , heat of reaction measurements and calculation of heat of reaction , Hess`s law, formation reaction and heat of formation , heat of combustion, Energy balance for combustion reaction, and adiabatic reaction temperature

Prerequisite: BE 131 and BE 103

PE 328 Water Treatment **3[2-0-3]**

Water chemical analysis, water treatment for different uses. Equipment design calculations. Water quality overview, water analysis and assay for special purposes, unit operations for water treatment and calculations. Treatment of produced water for reinjection in oil fields .

Prerequisite: PE 214

PE 329 Industrial Fibers Technology **3[3-0-0]**

Classification of manmade fibers general view. of the technological process for the production of manmade fibers regenerated fibers (viscous) synthetic fibers, polyamide, polyester ,acrylic and polypropylene fibers

Prerequisite: PE201

PE 330 Energy Conservation **3[2-2-0]**

Different methods of energy conservation: electrical energy conservation, lightening, energy saving, heat energy saving, insulation, reusing of hot waste water, application of solar energy, smart building, equipment design, sensors and computer controlled processes.

Prerequisite: PE200 and BE122

PE 333 Chemical Reaction & Industrial catalysis **4[3-2-1]**

The rate of reaction, interpretation of kinetic data, batch systems, flow systems reaction in series, the reaction rate constant, the reaction order, elementary reaction and molecularity. Reversible reactions and non-elementary reactions, reactor sizing, batch systems, volume change with reactions, Isothermal reactor design, continuous stirred tank reactors, (CSTR) and tubular reactors. Pressure drop in reactors, and unsteady state operation of reactors also covers Principles of the industrial utilization of heterogeneous catalysis, topics include adsorption phenomena, methodology in catalyst preparation, characterization and evaluation of catalysts, diffusion and reaction in porous catalysts, and a survey of major industrial processes

Prerequisite: PE 315and BE 103

PE 335 Polymer Science and Engineering (I) **3[3-1-1]**

Chemistry of polymerization and the polymer manufacturing process. It begins with basic concepts about polymers and polymerization and covers each major type of polymerization with relevant kinetics. The qualitative effect of reactor design on polymer manufacture is discussed as well as actual polymer.Basic structure-property relationship and covers many of the modern techniques used in the characterization and testing of polymers in order to determine the structural, thermal, mechanical, and chemical properties of polymers. Polymer structure, glass-rubber transition, mechanical properties, viscoelasticity, solution properties and methods of polymer analysis.

Prerequisite: PE213, PE217

PE 336 Polymer Science and Engineering II **3[3-0-1]**

Introduction to polymer processing, polymer rheology, major types of polymer processing focusing on extrusion, injection, molding, fiber spinning, film blowing, polymer formulation and additives.

Prerequisite: PE335

PE 339 Production of plastics **3[3-0-0]**

An overview on the plastics industry. Comparison will be made to the polymer production industry, non-plastic manufacturing industries .Raw materials for plastics production, thermoplastics, thermoset plastics, methods of plastics production.

Prerequisite: PE 201

PE 350 Process Control **3[3-0-2]**

General review of Laplace transforms Linear open-loop system. first-order systems alone and in series. Higher–order systems. Linear closed loop systems. Controllers and final control elements. Closed-loop transfer function . Transient response. Stability

Prerequisite: PE 320

PE 361 Fertilizers Industries **3[3-2-0]**

Natural gas as a source for feed stock for fertilizers industries. Gas – shift reaction, ammonia synthesis, urea production, nitric acid and nitrate fertilizers, formulation of fertilizers for specific needs.

Prerequisite: PE201

PE 362 Petroleum Refining & Evaluations of Its Products **4[3-2-2]**

Theories of petroleum origin, physical properties with the study of its curves, preparation of crude for refining operations& Chemical treatment of petroleum products. Processing of petroleum distillation, atmospheric and vacuumed distillation operation and its calculations, hydrogenation, isomerisation, thermal and catalytic refining, thermal and catalytic cracking, Dewaxing methods. Methods of refining with: alkalis, acids, solvent extraction& the standard specification for petroleum products

Prerequisite: PE 213

PE 368 Chemical Plant Design I **3[3-2-0]**

Introduction to design, flow sheeting, design information and data . studies involving application of chemical engineering economic principles to the design of selected chemical manufacturing process . Hazards , industrial safety , site location and plant layout . Detailed design procedure for selected equipment e.g. plat towers for distillation, design of liquid mixing systems, design of gravity settlers, reaction vessels .pumps, and compressors .

Prerequisite: PE327

PE 369 Chemical Plant Design II **3[3-2-0]**

Structure of chemical process systems and systematic methods for capital and operating cost calculations. Economic factors in design, economic balances, capital and operating cost estimation techniques, assessment of alternative investments and replacements, and application of compound interest calculations. Simple optimization theory. Evaluation of process alternatives. Equipment and materials selection. Factors such as energy, safety, hygiene, and environmental protection.

Prerequisite: PE368

PE 385 Optimization of Chemical Processes **3[3-2-0]**

Theory and methods of optimization. Linear, nonlinear, and dynamic programming. Applications on chemical reactor design. Heat transfer and energy conservation. Mathematical modeling and simulation.

Prerequisite: PE 333

PE 389 Introduction to Environmental Engineering **3[3-0-0]**

Clean environmental standards. Rules and regulations applied to soil, water and air. Sources of environmental pollution, estimation of pollutants in the environment and presentation of suitable schemes for abatement and control. The course unit focuses on the application of engineering principles for producing clean environment.

Prerequisite: PE210 and PE214

PE 390 Industrial Equipment and Material handling **3[3-2-0]**

Introduction to major equipment used in petrochemical industries. Pumps, heat exchangers, distillation columns, pressurized vessels and separators. Conveyors, cranes and packaging.

Prerequisite: PE317

PE 391 Manufacture of Synthetic Rubber **3[3-0-0]**

Classifications of synthetic rubber, general characteristic of rubber, raw materials for rubber production, butadiene rubber, styrene butadiene rubber, nitrile rubber.

Prerequisite: PE201

PE 392 Pollution Control in Petrochemical Industries **3 [2-0-2]**

Refinery liquid based treatment method, oxidation pond treatment, disposal of sludge, treatment of liquid effluents from petrochemical industries, Removal of ammonia from gases. The experimental part includes Measurement of pH, volatile matter, total solids, hardness, alkalinity, dissolved oxygen, BOD, COD, chlorides & turbidity.

Prerequisite:PE210

PE 400-1 Graduation Project (1) **4[3-0-3]**

Knowledge and previous design experience, particularly in the field of Specialization, and integrate all components of the curriculum together into one major project extending over the 9th and 10th semesters. Projects are industry-based.

Prerequisite: Approval of department council at the beginning of 9th semester.

PE 400-2 Graduation Project (2) **4[3-0-3]**

Completion of the requirement of PE 400-I in addition to new requirements, presentation and discussion.

Prerequisite: PE400-1

5/5 وصف المقررات الدراسية لقسم الهندسة الميكانيكية (تخصص قوى) بلائحة الكلية المعتمدة للطلاب الملتحقين بالفصل الدراسى خريف 2011/2010 و الخريجين فى الفصل الدراسى ربيع 2015

ME 170 Introduction to Manufacturing Processes **2Cr [2-0-2]**

The basics of manufacturing processes, machinery, tooling and safety.

ME 201 Fundamentals of Combustion Engineering **3Cr [3-1-1]**

Continuous and timed combustion. Fuel and ignition systems in reciprocating and rotary engines. Types of combustion chambers. Fuels and ignition quality. Thermodynamics of combustion. Chemical kinetics. Flame theory and flammability limits.

Prerequisite: ME 230

ME 202 Energy and Environment **3Cr [3-1-1]**

Conservation laws. Air quality standards. Meteorological phenomena. Gaseous emissions from power plants and motor vehicles. Emission measurements. Emission-control systems. Global warming. Ozone depletion. Water treatment. Wastewater treatment. Solid waste management. Nuclear waste management. Noise control.

Prerequisite: ME 251, SS

ME 203Mechanical Drawing **2 Cr[1-3-0]**

Projection and assembly of mechanical elements. Machining symbols. Fits and tolerances. Mechanical parts. Fasteners. Springs. **BE 142**

ME 210 Computer-Aided Mechanical Drawing **2Cr [1-1-3]**

Projection and assembly of mechanical elements. Fits and tolerances. 2D and 3D assembly mechanical drawings using AutoCAD and similar computer programs.

Prerequisite: ME 203

ME 211 Mechanics of Materials **4Cr [4-1-1]**

Types and properties of materials. Testing of materials (tension, compression, shear, bending, torsion, hardness, impact, creep, fatigue). Principal stresses. Thermal stresses. Stress concentration. Deflection and stiffness of mechanical members. Statically indeterminate members.

Prerequisite: BE 113

ME 212 Mechanics of Machinery **3 Cr [3-1-1]**

Joints. Mechanisms (kinematics and force analysis). Cam mechanism (profiles, minimum cam size, cam dynamics). Gear geometry. Gear trains. Flywheels. Balancing of rotating and reciprocating masses.

Prerequisite: BE 113

ME 213 Mechanical Design (1) **4Cr [3-2-1]**

Design considerations. Factor of safety. Design of detachable joints (threaded joints, keys and splines). Design of permanent joints (welding, riveting, adhesion, interference fitting).Fatigue and theories of failure. Column design, Power screws. Mechanical springs. Pressure vessels. Rotating disks.

Prerequisite:ME 211

ME 214 Mechanical Vibrations **3Cr [3-1-1]**

Single and multiple degrees of freedom systems. Free and forced vibrations. Machine isolation. Critical speeds. Dynamic absorbers. Vibration measurements. Torsional vibrations. Continuous systems.

Prerequisite: ME 212

ME 215 Mechanical Design (2) **3Cr [3-2-0]**

Gear drives. Ropes, belts, and chain drives. Clutches and brakes. Sliding (journal) bearings. Anti-friction (rolling element) bearings.

Prerequisite: ME 213

ME 216 Finite Element Method **3Cr [2-2-1]**

Displacement approach for simple elements. Generalization to 3D elements. Variational principles, transformation, assembly, boundary conditions, solution, convergence and stability. Isoparametric elements. Integration of FE in computer aided design.

Prerequisite: ME 215

ME 217 Mechanics of Materials and Mechanical Design* **4Cr [4-1-1]**

Properties of materials. Simple stresses. Principal stresses. Deflection and stiffness of mechanical members. Pressure vessels. Seals. Design of shafts. Drives (gear, ropes, belts and chain). Sliding and anti-friction bearings.

Prerequisite: BE 112

* Not Accredited for Mechanical Engineering Students.

ME 218 Mechanics of Machinery and Mechanical Vibrations* **4Cr [4-1-1]**

Mechanisms (kinematics and Force analysis). Gear trains. Free and forced vibrations. Machine Insulation. Critical speeds. Dynamic absorbers. Torsional vibrations.

Prerequisite: BE 112

* Not Accredited for Mechanical Engineering Students.

ME 219 Design and Mechanics of Machinery* **4Cr [3-2-1]**

Simple stress. Principals stress. Deflection of mechanical members. Design of shafts. Sliding and anti-friction bearings. Gear train. Gear and belt drivers. Flywheels. Balancing of rotating masses.

Prerequisite: BE 112

* Not Accredited for Mechanical Engineering Student

ME 220 Measurements and Sensors **4Cr [3-1-2]**

Electromechanical transducers. Error and uncertainties. Motion sensors (resistance inductance, proximity, piezoelectric, eddy current, Hall effect, digital). Force, torque and tactile sensors. Flow sensors (differential pressure, hotwire, electromagnetic, Laser doppler..). Temperature sensors (resistive, thermocouples, fiber optics, interferometrics,....). Ultrasonic, fiber optics and range sensors. Data acquisition (signal conditioning, A/D and D/A converters, PC-based acquisition)

Prerequisite: BE 122

ME 221 Automatic Control **4Cr [3-2-1]**

System modeling. Block diagrams. Time response to standard inputs. Stability analysis. Error analysis. Frequency response. Polar plot. Bode plot. Root locus. Basic control actions. Control tuning. Compensation techniques. Logic circuits.

Prerequisite: ME 214 or ME 218 for other departments

ME 230 Thermodynamics (1) **3Cr [3-2-0]**

Thermodynamics concepts and definitions, working substance, perfect gas laws. Properties of pure substance, forms of energy, first law of thermodynamics for closed and open systems, second law of thermodynamics and its applications, entropy. Carnot principles, air Standard Cycles. Gas compressors.

Prerequisite: ME 251

ME 231 Heat Transfer (1) **3Cr [3-1-1]**

Modes of heat transfer, steady one-dimensional heat conduction in: plane walls, cylinders and spheres, heat conduction with energy generation, heat transfer from finned surfaces, heat transfer in common configurations, transient heat conduction. Forced convection: over flat plate, across cylinders, tube-banks and inside tubes; natural convection: over surfaces and inside enclosures. Radiation heat transfer: radiation properties, view factors and radiation exchange between gray surfaces course project.

Prerequisite: ME 230

ME 232 Thermodynamics (2) **3Cr [3-2-0]**

Reciprocating machines, gas turbine power cycles, steam turbine power cycles, combined gas-vapor power cycles, flow through nozzles, types of steam turbines, turbine governing and control, course project.

Prerequisite: ME 230

ME 233 Heat Transfer (2) **3Cr [3-1-1]**

Thermal insulations: Selection and design problems, multi-dimensional problems, numerical methods in heat conduction, boiling and condensation, radiation heat transfer through gases, radiation heat transfer in enclosures, mass transfer by diffusion and convection, simultaneous heat and mass transfer, course project.

Prerequisite: ME 231

ME 234 Heat Exchangers **Cr [3-1-1]**

Classification of heat exchangers, overall heat transfer coefficient, heat exchanger analysis using: LMTD method/ ε-NTU method. Design and rating of: double pipe heat exchangers, shell-and-tube heat exchangers, air-cooled heat exchangers and compact type heat exchangers. Materials of construction and corrosion, flow-induced vibration, testing and inspection, maintenance, worked examples of heat exchangers.

Prerequisite: ME 231

ME 237 Thermofluids for Communication Engineers* **4Cr [3-2-1]**

Introduction to fluid mechanics and hydraulics. Pressure and flow measurements. Pipe flow. Pumps. Basic concepts of thermodynamics. The first and second laws of thermodynamics. Mechanisms and basic laws of heat transfer. Applications.

Prerequisites: BE 112, BE 122

* Accredited only for Communication Students.

ME 239 Thermal Engineering for Electrical Students* **4 Cr [3-2-1]**

Basic concepts of thermodynamics. Properties of pure substance. The first and second laws of thermodynamics. Mechanical forms of energy. Mechanisms and basic laws of heat transfer. Steady flow processes and engineering devices. Properties of moist air and psychometric chart, air conditioning processes and units.

Prerequisites: ME 259

* Accredited only for Electrical Students.

ME 240 Refrigeration and Air Conditioning (1) **3Cr [3-1-1]**

Introduction of refrigeration cycles, simple vapor compression cycle, multi-pressure compression cycles, cooling load calculations, psychometric chart, moist air psychometric processes, air conditioning cycles, cooling load calculations.

Prerequisite: ME 232

ME 241 Refrigeration and Air Conditioning (2) **3 Cr [3-1-1]**

Absorption refrigeration cycles, compressors, evaporators, condensers, expansion devices, cooling and heating coils, humidifires and dehumidifires, chemical dryers, water-cooled and air-cooled chillers, cooling towers, chilled water pumps, equipment selection, design of air ducts, piping design, course project.

Prerequisite: ME 240

ME 251 Fluid Mechanics (1) **3Cr [2-2-1]**

Fluid properties, Pressure measurements and applications, Total pressure on surfaces, Buoyancy; Fluid masses subjected to acceleration. Kinematics of fluid flow. Equation of Continuity, Euler, Bernoulli and Energy equations and their applications.

Prerequisite: BE 112

ME 252 Engineering Fluid Mechanics **4Cr [3-2-1]**

Similarity and model testing. Flow through pipes. Networks of pipes. Pumps.

Prerequisite: ME 251

ME 253 Fluid Mechanics (2) **3Cr [3-2-0]**

Elementary Hydrodynamics. Three-dimensional continuity equation, Navier-Stokes equations and applications. Boundary layer theory and applications. Introduction to turbulent flow.

Prerequisite: ME 251

ME 254 Compressible Flow **3Cr [3-2-0]**

Mach Number and speed of sound, Basic equations for one-dimensional compressible flow. Adiabatic frictionless nozzle flow, Adiabatic flow with friction in a duct. Isothermal gas flow in pipes and channels, Shock waves, Frictionless flow in a constant area duct with heat transfer, Compressible flow through nozzles, Applications.

Prerequisite: ME 251

ME 255 Pipeline Fundamentals **4Cr [3-2-1]**

Introduction. Single-phase incompressible and compressible flow in pipes. Unsteady flow, None-Newtonian fluids in pipes, Flow of solid/liquid mixture, solid/air, and capsules in pipes. Pipe fittings, valves, and pressure regulators. Pumps, compressors and blowers. Flow meters, sensors and automatic control systems.

Prerequisite: ME 252

ME 256 Power Generation by Fluids **3Cr [3-2-0]**

Hydraulic turbines (types, construction, operation and control). Hydraulic power stations, Pumped-storage system. None-classical methods for energy production from fluids, Wind energy and windmills, Sea wave energy, Tidal energy. Innovations in designs for energy production from fluids.

Prerequisite: ME 252

ME 257 Computer Applications in Fluid Mechanics **3Cr [3-0-2]**

Use of numerical methods and programming for solving applied problems in various areas of fluid mechanics.

Prerequisite: ME 253, BE 207

ME 258 Environmental Fluid Mechanics **3Cr [3-2-0]**

Introduction and fundamental concepts. Review of basic principles of fluid mechanics and heat transfer. Energy balance of the environment. Static equilibrium of the environment. Kinematics and dynamics of the environment. Geostrophic motion, boundary layer, applications.

Prerequisite: ME 251

ME 259 Fluid Engineering for Electrical Students* **4Cr [3-2-1]**

Fluid properties. Static pressure and measurements. Continuity and energy equations, flow measurements. Real flow through pipes. Dynamic head and positive displacement pumps.

Prerequisite: BE 112, BE 122

* Accredited only for Electrical Students.

ME 261 Engineering Economy and Cost Analysis **Cr [3-2-0]**

Basic principles and techniques of economic analysis. The time value of money and inflation. Economic decision-making regarding short-term and long-term capital investment alternatives. Depreciation models, replacement and procurement models and Public utilities. Analysis is made variously assuming certainty, risk and uncertainty

Prerequisite: HU 133

ME 262 Operations Research **3Cr [3-2-0]**

Linear programming, model formulation, graphical and simplex methods, revised simplex method, duality, and sensitivity analysis. Decision analysis, discrete state stochastic processes: Markov assumption, applications to queuing, inventory models *and game theory.*

Prerequisite: HU 133

ME 263 Introduction to Engineering Management **2Cr [2-2-0]**

The role of engineers in management systems. Basic Business functions, management objectives, tasks, and leadership techniques. Human relationships in a technical environment. Productivity/quality enhancement through an understanding of organizational design and behavior, motivation and reward systems, and participative management. Management tools and methodologies.

Prerequisite: None

ME 270 Materials Engineering **2Cr [2-0-2]**

Introduction to materials. Crystal structure of solids. Construction and use of phase diagrams in materials systems. Types of steels, cast irons, copper alloys and aluminum alloys. Heat treatment of steels. Types of polymers, ceramics, glasses, and semi conducting materials and their applications.

Prerequisite: ME 170

ME 271 Manufacturing Processes (1) **3Cr [3-0-2]**

Metal casting processes and equipment, analysis of metal forming and shaping processes Discussion of the principles and methods of heat treatment.

Prerequisite: ME 170

ME 272 Manufacturing Processes (2) **3Cr [3-0-2]**

Mechanics of 2-D and basic 3-D cutting. Industrially applicable, mechanistic force models for practical processes including turning, facing, boring, face milling, end milling, drilling, shaping and grinding. Surface generation and wear-based economic models.

Prerequisite: ME 271

ME 303 Performance and Emissions of Automotive Engines **3Cr [3-1-1]**

Thermodynamic analysis of fuel-air cycles. Combustion charts. Chemical equilibrium and dissociation. Control of exhaust emissions. Engine friction. Heat transfer. Engine energy balance. Testing and performance maps.

Prerequisite: ME 201

ME 306 Gas Turbines **3Cr [3-1-1]**

Types of axial and radial turbines and compressors. Fuel systems. Combustion chambers. Design considerations and performance maps. Emission control.

Prerequisite: ME 232

ME 321 Robotics **3Cr [2-1-1]**

Basics of Robotics. Homogeneous transformation. Arm kinematics. Inverse kinematics. Arm dynamics. Trajectory planning. Robot control system. Position, speed and force control of robot grippers. Practical examples.

Prerequisite: ME 212, ME 221

ME 324 Artificial Intelligence **3Cr [3-1-1]**

Introduction to intelligent control. Fuzzy Logic. Structure and design of fuzzy controller. Principles of neural networks. Neural networks for control and modeling. Neuro fuzzy control systems. Advanced applications.

Prerequisite: ME 221

ME 327 Numerically Controlled Machines **3Cr [3-1-1]**

Components of CNC machines. Command generation in machine: linear interpolation, cubic polynomials, point-to-point motion. Controlled rate of change of acceleration. Feed forward control, Programming of CNC machines.

Prerequisite: ME 221

ME 328 Introduction to Mechatronics **3Cr [3-1-1]**

Mechatronics as interdisciplinary system. Digital systems. Signal processing and data acquisition systems. Sensors. Actuators. Design of mechatronics systems using PLC, PC, and microcontrollers (hardware and software).

Prerequisite: ME 221

ME 331 Thermal Power Plants Equipment 3Cr [3-1-1]

Introduction, feed lines, feed water heaters, pumps, deairator, feed water tank, evaporators, cooling towers, steam pipeline design, steam traps, boiler controls, optimum selection of thermal power equipment, energy saving in thermal equipment, course project.

Prerequisite: ME 230

ME 332 Power Plant Operation and Management 3Cr [2-2-0]

Introduction, load curves, Part load problems, power plant economics, selection of plant-place- number and type of units, network linkage, forced outage, economical load distribution on units and plants, operation, maintenance and inspection of steam generators, steam turbines, condensers and cooling towers, accessories and gas turbine plant components, course project.

Prerequisite: ME 230

ME 333 Renewable Energy Systems and Energy Storage 3Cr [3-1-1]

Principles of nuclear energy, nuclear reactors and power plants, geothermal energy, types of geothermal energy systems, solar energy, solar collectors, solar- thermal power systems, solar electric conversion systems, wind energy, thermal storage systems: types and characteristics, course Project.

Prerequisite: ME 230

ME 334 Water Treatment and Desalination Technology 3Cr [2-2-0]

The course covers, Methods of desalination and water treatment, technologies of thermal and membrane units, basic calculations of thermal and membrane units, other desalination and water treatment units. Water treatment of: boilers, condensers, cooling towers and water chillers. Pre- and post treatment, economics of desalination and water treatment technologies, operation and maintenance of desalination and water treatment units, treatment of corrosion and scale deposits, industrial waste water treatment.

Prerequisite: ME230

ME 340 Thermal System Design and Optimization 3Cr [3-2-0]

Introduction, thermodynamics modeling and design analysis, exergy analysis, heat transfer modeling, and design analysis. Applications with thermodynamics, heat and fluid flow, economics and thermo-economics analysis, optimization, worked problems.

Prerequisite: ME 234

ME 341 Controls and Safety of thermal Systems **2Cr [2-0-1]**

The aim of this course is to inform the students with the importance of control of thermal system from economical and safe operation point of views.

Definition of control and safety devices, electric, electronic & microprocessor (direct digital control DDC) controls, design of control circuits for thermal equipment. Performance of control system at part-load operation, case studies for different applications: chilled water system, central heating system.

Prerequisite: ME 221

ME 342 Industrial Ventilation **3Cr [3-2-0]**

Natural and forced ventilation, general and local ventilation, calculations of ventilation loads, ventilation systems, hood design and selection, fans, air filtration systems; case studies.

Prerequisite: ME 240

ME 343 Air Conditioning Systems **3Cr [2-2-0]**

All air central system, all water central system, air-water central system, air handling units, fan coil units, design of supply and return air ducts, hot and cold water piping system design, fans, ventilation and exhausters; case studies.

Prerequisite: ME 240

ME 345 Applications in refrigeration **3Cr [2-2-0]**

Cold stores, cold trucks, freezing tunnels, freezers, deep freezing, ice manufacturing, skating ring, liquefaction of gases; case studies.

Prerequisite: ME 240

ME 346 Applications in Air Conditioning **3Cr [3-2-0]**

Cinema, theaters, museums, houses, hospitals, vehicles and industrial air conditioning, clean area, ventilation: garages, W.C., wood factories, flour factories, metal forming factories and labs.

Prerequisite: ME 241

ME 347 Trouble Shooting and Maintenance of Thermal Systems **Cr [3-2-0]**

Trouble shooting & preventive maintenance of : simple compression refrigeration cycle, multi-pressure cycles, air handling units, fan coil units, filters, pumps, cooling towers. Weekly, monthly, quartly/hafly and yearly maintenance of thermal systems.

Prerequisite: ME 241

ME 350 Pumps Technology **2Cr [2-1-0]**

Introduction. Types, constructions, materials, control and valves. Pump systems, Pump services, Intake and suction piping. Selection and purchasing pumps. Installation, operation and maintenance, Pump testing.

Prerequisite: ME 252

ME 352 Pipeline Technology **3Cr [3-2-0]**

Planning, construction and operation of pipelines. Design of pipeline, Load consideration, Protection of pipelines. Legal, safety and environmental issues on pipelines, Code, standards and government regulations.

Prerequisite: ME 255

ME 353 Fluid Power Systems **3Cr [3-2-0]**

The course covers, Introduction. Hydraulic fluids and transmission lines, Fluid power actuators, Hydraulic pumps, Control valves, Accumulators and pressure intensifiers. Hydraulic circuit design and analysis. Pneumatic systems and applications.

Prerequisite: ME 252

ME 356 Technology of Multi-Phase Flow **3Cr [3-2-0]**

Introduction. Flow patterns, One-dimensional flow, Empirical methods for pressure drop, Void fraction. Draft flux model. Vertical bubble and slug flow, Gas particle flow.

Prerequisite: ME 253

ME 357 Applied Piping Systems **3Cr [3-2-0]**

This course concentrates on one or more of the following piping systems: water, fire protection, steam, building services, oil, process, cryogenic, refrigeration, hazardous, slurry and sludge, wastewater, plumbing, ash handling, compressed gas and vacuum, and fuel gas distribution.

Prerequisite: ME 255

ME 358 Maintenance of Fluid Systems **3Cr [3-0-2]**

Introduction, Maintenance approaches. Maintenance of: pumps, compressors, valves, and hydraulic equipment. Seals, Lubrication and oil analysis.

Prerequisite: ME 350, ME 351

ME 359 Valves Technology **3Cr [3-1-1]**

Overview. Valves: types, selection, specifying, installation, and operation. Valve performance and characteristics. Control valves, Actuators. Valves maintenance and troubleshooting.

Prerequisite: ME 252

ME 360 Production Planning and Scheduling 3Cr [3-2-0]

Applications of operations research methods to practical problems of production planning and inventory control. Forecasting; aggregate planning; deterministic and stochastic inventory models; MRP; JIT; variability; scheduling in production and service systems.

Prerequisite: None

ME 361 Facilities Design 3Cr [2-3-0]

Application of analytical methods to facility planning. Facility layout design and equipment specification. The physical organization of work places and departments. Economic selection of materials handling equipment and integration of equipment into the layout plan. Computer solutions for layout problems and mathematical models for location problems.

Prerequisite: ME 360

ME 362 Quality Improvement for Industry 3Cr [3-2-0]

Quality management philosophies (Deming,..Etc.). Strategies for continuous improvement. Graphical and numerical methods of data analysis. Process control charts. Design and analysis of experiments for process characterization and improvement.

Prerequisite: ME 170

ME 363 Human Factors Engineering 3Cr [3-1-1]

Basic ergonomic principles needed to recognize and evaluate workplace ergonomic problems; physiological, anthropometric, environmental factors and performance. Work Measurement. Facilities organization and work place design

Prerequisite: ME 360

ME 364 Systems Simulation 3Cr [2-2-1]

Simulation modeling of discrete stochastic processes, random number generation, random variates , analysis of simulation results. Development of computer simulation models of real or conceptual systems. Interpretation of results of computer simulation experiments

Prerequisite: ME 262

ME 365 Linear and Network Programming 3Cr [2-2-0]

Modeling and optimization of linear network problems. Mathematical model design, network problems and algorithms, and PERT/CPM. Time/cost analysis. Special types of networks. Software for network problems.

Prerequisite: ME 262

ME 367 Supply Chain Systems **3Cr [2-2-0]**

Concepts related to the design, evaluation, and performance of supply chain systems. Information in the supply chain. Transportation. Vendor-managed inventories. Analytical frameworks, and case studies.

Prerequisite: ME 360

ME 368 E-business Applications **3Cr [2-1-2]**

Web Site Models Overview. Select the Activities for E-Business. E-Commerce Models. Choosing a Company and a Web Name. Virtual Funds vs. Conventional Funds. Processing Orders Offline and Online. Internet Merchant Accounts. Web Development Tools. Choosing a Web Host and Domain Registration. Privacy and Security Issues. Marketing. Web Site Pricing

Prerequisite: ME 360

ME 370 Analysis of Metal-Cutting Processes **3Cr [3-1-1]**

Advanced study of metal cutting involving the mechanics of metal cutting including cutting forces, tool-wear/tool-life, temperature analysis, surface finish and integrity, chip control, machinability assessments and advances in cutting tool technology.

Prerequisite: ME 272

ME 371 Manufacturing Process Machine Design **3Cr [3-2-0]**

Applying machine design principles to manufacturing process machines and tooling; integrating machine elements; precision machine design. Designing and analyzing the effects of loading, combined stresses, and deflections on machine process capability. Sensors applied to process machines

Prerequisite: ME 272

ME 372 Metrology and Instrumentation **3Cr [2-0-3]**

Principles of fits and geometric dimensioning and tolerancing. Primary-measuring tools. Errors (types - evaluation - analysis). Gauges. Mechanical, electrical, and optical magnification. Comparative measurements. Angle measurements. Instruments and their applications to industrial processes measurements, associated control functions of circuits, principles underlying various measuring elements, determination of quantities to be processed, and feedback control problems

Prerequisite: ME 170

ME 373 Nonetraditional Manufacturing Processes **3Cr [3-1-1]**

Fundamentals of Nonetraditional manufacturing processes. Theory and implementation of the Nonetraditional manufacturing processes, such as laser cutting and welding, electro discharge machining, abrasive water jet machining, rapid prototyping, etc

Prerequisite: ME 324

ME 374 Manufacturing Systems **3Cr [3-2-0]**

Fundamentals of design, planning and control of manufacturing systems aided by computers. Concepts of control hardware, NC programming, software aspects related to NC manufacturing, programmable controllers, and performance modeling of automated manufacturing systems, group technology and flexible manufacturing systems. A detailed investigation of computer-aided manufacturing, robotics, and lean/agile manufacturing.

Prerequisite: ME 272

ME 376 Product Design and Innovation **3Cr [3-2-0]**

Fundamentals of concurrent engineering, product life cycle, product specification, standardization, functional requirements and datum features, selection of materials and manufacturing processes, cost analysis, case studies on designing for quality, economy, manufacturability and productivity. Applications of reverse engineering

Prerequisite: SS

ME 377 Condition Monitoring and Diagnostics **3Cr [2-1-2]**

Basic methodologies of condition monitoring and diagnostic tools. Vibration signal measurement and analysis. Noise assessment and analysis. Thermograph. Used oil and wear debris analysis.

Prerequisite: ME 371

ME 378 Manufacturing Engineering Design Methodology **3Cr [3-2-0]**

Design for manufacturing, concurrent design, human factors, cost analysis, and material selection. Topics include design methodology and general design principles for manufacture ability, design for forming, assembly, material removal, joining, casting, forming, material removal, and joining processes

Prerequisite: ME 272

ME 400-1 Graduation Project (1) **4Cr [3-0-3]**

Students use all of their knowledge and previous design experience, particularly in the field of Specialization, and integrate all components of the curriculum together into one major project extending over the 9th and 10th semesters. Projects are industry-based

Prerequisite: SS, DA

ME 400-2 Graduation Project (2) **4Cr [3-0-3]**

Students use all of their knowledge and previous design experience, particularly in the field of Specialisation, and integrate all components of the curriculum together into one major project extending over the 9th and 10th semesters. Projects are industry-based

Prerequisite: SS

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LEVEL TWO:

Third Semester:

AE111 Basic Design

Credit Hours: 4 **Teaching Hours: 2hrs. Lecture + 4hrs. Studio**

The Course is to teach the students a simplified definition of architecture, magnifying the visual aspects of architectural balance, and introducing students to all the concepts of visual design using the freehand as a way of presentation.

The course also intends to improve the freehand and free sketch skills for the architecture students increasing their visual sense of proportion and scale.

The course is to give a brief explanation and introduction to orthographic projection.

Prerequisites: None

AE121 Building Technology Level-1

Credit Hours: 4 **Teaching Hours: 2hrs. Lecture+ 4hrs. Studio**

This course introduces the students to the working drawings, and its way of presentation. By the end of this course the student should be able to identify the different structure systems and be able to understand and detail all the architectural and structural elements of a building; starting from the different types of footings, the building unit of a wall, the R.C elements, different types of insulation, and openings of a concrete structure and staircases

Prerequisites: None

AE141 Colors in Built Environment

Credit Hours: 3 **Teaching Hours: 2hrs. Lecture+ 2hrs. Exercise**

The Course is to teach the students all about the visual characteristics of materials, and all about the colors whether pigment or light colors.

The course introduces the student to all types of harmonies in color combination, and all theories of colors.

The student is to use gauche and water colors to experience the theoretical part of the course in a practical way through already given 3D, and 2D drawings.

Prerequisites: None

AE151 Computer Aided Drafting 1

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 2hrs. Exercise

This course introduces the student to the CAD conception in the 2D architectural drawings; teaching them all about the drawing methods and techniques, emphasizing on the methods of facilitating the repetitive tasks and saving time, the course should help the student monitor the building systems, and details, also manage the integration of CAD programs and the design process.

Prerequisites: None

AE131 History and Theories of Architecture-1

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

The Course is to teach the students all about the theoretical part of the Architectural Design and the history of architecture of the Ancient Civilizations.

It is composed of three parts:

Theory of Architecture: in this course the student is to learn the basics and principles of Architecture, space design, and architectural compatibility.

Design Principles: Drawing systems and Architectural expressions, physical and functional components of the building.

History of Ancient Civilizations: introduces the student to the history of the major civilizations, architecture found in the valley of the Nile (Egyptian civilization), architecture of Greece, orders, and Greek Art, Hellenistic Kingdom and the architecture and art of the Roman Empire.

Prerequisites: None

HU 161 Environment and Society

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

This course addresses the human role towards the environment. It defines environment, the world's different types of environments, the natural life, human lives, the changes that occur to the environment and their effects on the present & future lives of the societies.

Prerequisites: None

LEVEL TWO:

Fourth Semester:

AE210 Architectural Design 0

Credit Hours: 4 Teaching Hours: 2hrs. Lecture+ 4hrs. Studio

The course is to teach the students the basics of the architectural language using the pencil methods and techniques as a way of architectural communication, introducing them to the orthographic projection, isometrics, and axonometric drawings of basic forms. Also introducing them to precise and accurate drawing skills; drawing classical Roman and Greek Orders.

Student by the end of the course should also understand the architectural drawings and be able to draw a small housing unit, using the module and the scale, presenting their work with pencil or pen and ink.

Integrated Design and Building studio starts the 4th semester and the building systems studied in AE121 Building Technology (1) and AE122 Building Technology (2) are applied on the design project worked in AE210 Architectural Design 0. Thus a closer integration of technological and structural aspects within the design studio will take place.

Prerequisites: AE111

AE122 Building Technology Level-2

Credit Hours: 4 Teaching Hours: 2hrs. Lecture+ 4hrs. Studio

This course introduces the student to two different ways of construction, steel, and wood structures. By the end of this course the student should be able to detail the different types of steel structures and all its connections, including the different types of steel stairs. Also the student should be able to detail the wood structures, with all its details, from its connections with the footings, the wood walls, slabs, roof and Wood Stairs.

Integrated Design and Building studio starts the 4th semester in studio in relation to AE210 Architectural Design 0.

Prerequisites: AE121

AE142 3D Projection and Shadows

Credit Hours: 3 Teaching Hours: 2hrs. Lecture+ 2hrs. Exercise

The first part of the course is to teach the students the behavior of shadows with the different 3D forms, surfaces and projections.

The second part of this course introduces the student to 3D perspectives drawn in freehand sketches or using manual drawing tools.

By the end of this course the student should be able to draw 3D Perspectives of one, two, or multiple vanishing points for external or internal shots for any given building, and be able to draw the full shades and shadows for that building in any projection

Prerequisites: BE142

AE152 Computer Aided Drafting 2

Credit Hours: 2 Teaching Hours: 1hr Lecture+ 2hrs. Exercise

This course focuses on three dimensional design, using programs like CAD as an important means in architectural presentation which enable students to present advanced designs by adding materials.

Prerequisites: AE151

AE246 Environmental Studies in Architecture

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

This course is about understanding all about the basics of the environment.

The relationship between the built and the natural environment; methods and techniques of human comfort indoor, studying the passive techniques of solar design, ventilation and wind effect on the built environment

Prerequisites: None

CV254 Surveying:

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 1hrs. Exercise+1hrs lab

This course introduces the architecture student to the understanding of the need for the surveying, recent developments in surveying instrumentation and computing techniques, also the student should be able to understand slop analysis, radial positioning and mapping systems.

Prerequisites: BE101

LEVEL THREE:

Fifth semester:

AE211 Architectural Design Level-1

Credit Hours: 6 Teaching Hours: 2hrs. Lecture+ 8hrs. Studio

The Course is to teach the students a simplified definition of architectural Design; this course is to improve the student's sense of relationship between the human scale and the architectural space, the module, and the relationship between the different stories of a building.

By the end of this course the student should be able to design a small villa of two stories, and design its elevation.

The suggested way of presentation techniques is the pen and ink.

An integrated design studio concept is adopted in studio in relation to each of AE221 Building Technology (3).

Prerequisites: AE210

A221 Building Technology Level-3

Credit Hours: 4 Teaching Hours: 2hrs. Lecture+ 4hrs. Studio

This course introduces the students to the detailed working design, focusing on the various finishing materials; for floors, ceilings, and walls.

The course also deals with the special finishes, like Curtain Walls, facings and claddings for the external skin of the building, different types of light partitions.

An integrated design studio concept is adopted in studio in relation to AE211 Architectural Design (1).

Prerequisites: AE122

AE331 Theories of City Planning

Credit Hours: 3 Teaching Hours: 2hrs. Lecture+ 2hrs. Exercise

This course discusses the definitions and terminology of urban pattern and the typology of planning (physical planning, social planning, and economical planning). Also:

1. Historical background (historical cities and their planning concepts).
2. Types of city forms.
3. Land use zoning and planning.
4. Circulation and transportation.
5. General planning and neighborhoods organization.

6. Master plan project.
7. Site planning considerations.
8. City, community and neighborhood facilities.
9. City planning in the digital era.

Prerequisites: None

AE132 History and Theories of Architecture-2

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

Theory of Architecture: Design Process and constrains

Design Principals: Building Typology and location in the urban pattern of the city, residential and educational building types.

Medieval Age Architecture: the architecture of the mediaeval era, starting form the end of the Roman Empire and the raise of the Christianity, the Byzantine architecture, and the Romanesque architecture, ending with the Gothic architecture in Europe.

Prerequisites: AE131

CV252 Theory of Structure:

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 2hrs. Exercise

This course introduces the architecture student to the understanding of structures, and the forces affecting them, through structural analysis for different types of structures, internal forces for beams, frames, and trusses.

By the end of the course the student should be able to understand the difference between tension structural and compression structural elements, and be able to estimate approximately the dimensions of the structural elements in buildings.

Prerequisites: None

LEVEL THREE:

Sixth semester:

AE212 Architectural Design Level-2

Credit Hours: 6 Teaching Hours: 2hrs. Lecture+ 8hrs. Studio

The Course is to teach the students the importance of the hierarchal design process thought out the programming, data collection, analysis, searching for ideas, the evaluation and the development for the chosen idea. Analytical studies are the important aim of this course through:

- Functional relationships between the building components

- The relation between the building masses and the given layout
- Circulation routs, their hierarchy and their relation to the building entrances, exits and the vertical circulation.

An integrated design studio concept is adopted in studio in relation to AE222 Details Design (1).

Prerequisites: AE211

AE222 Design Details Level-1

Credit Hours: 4 **Teaching Hours: 2hrs. Lecture+ 4hrs. Studio**

This course introduces the student to the working design drawings, focusing on the way of presenting the basic working drawings of a building, with the layout design and the building implementation.

An integrated design studio concept is adopted by adding the actual hours spent in studio in relation to each of the AE212 Architectural Design level 2 & AE222 Details Design 1.

An integrated design studio concept is adopted in studio in relation to AE212 Architectural Design (2).

Prerequisites: AE221

AE133 History and Theories of Architecture-3

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

Theory of Architecture-3: building forms, construction and structural systems.

Design Principals: Design Principals of cultural buildings, like museums, libraries, theatres, etc in addition to hospitals and health-centers.

Islamic Architecture: introduces the student to the philosophy and the life style of people in this era and its effect on architecture, the course is to study the urban planning, and the architecture of this era, in both the residential and religious buildings in several periods; the Abbasid period to the Ottoman Turks, with emphasis on the architecture of Islam in Egypt.

Prerequisites: AE132

AE241 Technical Systems in Buildings

Credit Hours: 3 **Teaching Hours: 3hrs. Lecture**

In this course the student is to take an overall look to the building technical systems, and their relation to the internal design elements; plumbing, water supply and their relation to the interior design of bathrooms and kitchens, mechanical circulation in public spaces, HVAC systems and ceiling design.

Prerequisites: None

AE232 Site planning

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

This course includes introduction- definitions and historical background- interaction between nature and human environment- study basic design elements (land- buildings- landscape- plants…) - infrastructure elements- architectural site planning according to environmental needs.

Prerequisites: None

CV255 Materials Testing:

Credit Hours: 2 **Teaching Hours: 1hr. Lecture+ 2hrs. Exercise**

This course introduces the architecture student to the understanding of building materials, its components, and loads bearing. Also tests of compression, and tension on concrete clocks and steel members, should be done by the students under supervision.

The student should make a research about any architectural material.

Prerequisites: None

LEVEL FOUR:

Seventh Semester:

AE311 Architectural Design Level-3

Credit Hours: 6 **Teaching Hours: 2hrs. Lecture+ 8hrs. Studio**

The Course aims at teaching the student the architectural and structural grids and the relation between them, in a single function building, also the universal spaces design. Then students should explore the multi-storey single function buildings design and the single function complex with different masses, and different structure systems in which the student should start thinking of the relationship between his built environment and the natural one, and the methods of environmental control. The student in this course should be able to completely express his/her thoughts and ideas, the instructor should help the student to form new concepts. The student might explain his/her ideas using handmade models or computer generated 3Ds.

Urban Design is introduced as well and the site constraints are investigated and analyzed. In addition the integrated design studio concept is adopted by adding the actual hours spent in studio in relation to each of the AE311 Architectural Design level 3 & AE321 Details of Design2.

Prerequisites: AE212

AE321 Design Details Level-2

Credit Hours: 4 **Teaching Hours: 2hrs. Lecture+ 4hrs. Studio**

This course introduces the student into the technical systems in buildings; the student should understand the schematic methods of design, and drawing techniques of Electrical systems, Plumbing, Water Supply, Electronic Vertical Circulation, and HVAC systems.

In addition the integrated design studio concept is adopted in studio in relation to AE311 Architectural Design (3).

Prerequisites: AE222

AE333 Urban Design

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

In this course the student is to study the urban space as a very important element to form the city image, its divided into several parts:

1. Urban design terminology, historical background, and urban spaces typology
2. Theories of urban spatial design
3. An urban space features (spaces, buildings, pathways, edges, approaches and values).
4. Peoples and urban space (human needs, human scale, culture and traditions).

In addition to the examination of the nature of the traditional urban spaces, this course then discusses the relation between the environmental features and urban spaces. Development of urban spaces in the late 20th century. In addition to learning the strategies of correcting local problems of spatial structure in the Egyptian cities.

Prerequisites: None

CV256 Soil Mechanics:

Credit Hours: 2 **Teaching Hours: 1hrs. Lecture+2hrs Exercise**

This course introduces the students to the types of buildings foundation, different types of soil, soil tests, measurements, and capacities. Piles should be studied in details.

Prerequisites: CV255

AE348 Theories of Housing

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

This course introduce to the students housing and its guided theories by analyzing housing issues and the challenges facing it highlighting factors affecting it locally and universally.

Prerequisites: None

HU 113 Technical Reports Writing and Presentation Skills

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

The course teaches the students the basic skills of writing. The student is introduced to the methods of data collection and its preparation for report writing for projects and industrial purposes. Patterns of writing are presented through the use of formal-informal reports.

Prerequisites: None

LEVEL FOUR:

Eighth Semester:

AE312 Design Applications (Architectural Design)

Credit Hours: 6 Teaching Hours: 2hrs. Lecture+ 8hrs. Studio

In this course the students should explore and make a research about the methods and techniques of historical heritage conservation and preservation, the student should be able to design new buildings in a historical area, and be able to protect the heritage with respect to the new trends and spirit of the age, learn how to work in groups in certain stage of the architectural design process, and then get separated in another stage. A group of 4 to 6 students should start developing an already existing site, and then each one of the team must start designing only one block from the suggested development.

This course aims at teaching the student the respect of the existing urban fabric and methods of site planning and development. The student might explain his ideas using hand made models or computer generated 3Ds

The integrated design studio concept is adopted in relation to AE322 Details of Design (3).

Prerequisites: AE311

AE322 Design Details Level-3

Credit Hours: 4 Teaching Hours: 2hrs. Lecture+ 4hrs. Studio

This course is about teaching the student methods of detail design; the student is to study a detailed architectural space, exploring new materials, technologies, the student also might study an already existing space or a piece of – library resources might be used – And suggest new details and methods of fixation.

The integrated design studio concept is adopted in relation to each of the AE312 Architectural Design (3).

Prerequisites: AE321

AE134 History and Theories of Architecture-4

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

This course is divided into two parts, he first is to trace the evolution of architectural theories through the modernism and the post-modernism; the evolution of architecture through the pre-modernism, modernism, and late modernism till the age of cyberspaces and the digital architecture, the technological evolution in the post-renaissance era till the new millennium; and the futuristic expectations in technology and its effect on the evolution of architecture.

The second part (historical) introduces the students to the architecture of the Renaissance and post Renaissance in Europe discussing the Renaissance architecture in Italy, France, Spain, Portugal, Austria, Germany, and Russia.

The course takes a quick view of the landscape and planning in the Renaissance era.

Prerequisites: AE133

CV253 Reinforced Concrete and Steel Structures

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 2hrs. Exercise

This course is an introduction to the principles, and methods of designing reinforced and pre stressed concrete structures.

The second part of the course is about steel structures, by the end of this course the student should be able to design small steel structures, identify steel sections used in his/her design, connections, and roughly calculate forces affecting this structure.

Prerequisites: CV252

AE347 Interior Design

Credit Hours: 3 Teaching Hours: 2hrs. Lecture+ 2hrs. Exercise

This course is to teach the student the interior design process and the relationship between the different internal planes of an architectural space, materials, lights and new technologies affecting the internal space design.

Prerequisites: AE141 & AE311

LEVEL FIVE:

Ninth Semester:

AE400-1 Graduation Project part 1

Credit Hours: 4 **Teaching Hours:1 hr. Lecture+ 6hrs. Studio**

This course is an introductory course for the graduation project, in this course the student with the help of his/her teacher should choose the type, name and site of the graduation project. By the end of this course the student should complete a written research about the chosen project, with a complete finalized program, site analysis, and some of the latest examples of similar projects.

Prerequisites: AE312

AE345 Building Law

Credit Hours: **2** **Teaching Hours: 2hrs. Lecture**

In this course the student should know all about architectural legislations (building laws- urban organization and planning acts)

Prerequisites: None

AE431 Housing Economics

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

This course introduces to the students economic theories which control housing projects and their variety- feasibility study and its elements- Project development cycle- financial features, investment and human resources.

Prerequisites: None

AE135 History and Theories of Architecture-5

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

Routes, influences and evolution of contemporary architectural movements- study of architectural philosophy of modern architecture pioneers- principles of criticism for art and architecture and evaluation of architecture projects

Prerequisites: AE134

AE341 Specifications and Quantities

Credit Hours: 2 **Teaching Hours: 1hr. Lecture+ 2hrs. Exercise**

Methods of measurement counting quantities for construction works- keeping track on site-preparation and analysis of inventories and tabulation of cost- writing specifications documents for materials- Preparation of bids.

Prerequisites: AE222

HU 141 Ethics and Human Rights

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

This course addresses ethical behavior of the profession. It surveys the main ethical tradition according to the agreed code of profession behavior. It engages a range of practical issues including the concept of human rights with all its different aspects on both the local and international standards.

Prerequisites: None

LEVEL FIVE:

Tenth Semester:

AE400-2 Graduation Project Part 2

Credit Hours: 8 **Teaching Hours: 2hrs. Lecture+ 12hrs. Studio**

In this course the student is to apply most of what was learn in the previous years of architectural studies, the graduation project should reflect deep studies of the effect of architecture on society, culture, and economy. The project also should be of great importance to Alexandria. The project should be an application to the latest trends, materials, and technologies.

The integrated design studio concept is adopted through including the study and presentation of architectural and structural details into the graduation project.

Prerequisites: AE400-1

AE342 Project Management

Credit Hours: 2 **Teaching Hours: 2hrs. Lecture**

This course is about understanding all about modern methods of executive process for compatible project- sharing elements in this process- introduction to analyze duration of operating project cycle- how to make schedule for project- supervising process- cash flow analysis and its relation to project stages.

Prerequisites: None

AE344 Professional Practice

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

In this course the student should know all about the construction contract, different members of the construction project and the relationships between them, different types of contracts, competitions, and ethics of practicing architecture.

Prerequisites: AE345

AE343 Building Regulation and Codes

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

In this course the student should understand to respect building laws in Egypt, build own general knowledge about different types of buildings regulations, with practice and exercises about building dimensions, heights, recesses and projections.

Prerequisites: None

HU 164 Research Methods and Techniques

Credit Hours: 2 Teaching Hours: 2hrs. Lecture

The course addresses effective methods of research. Students learn how to arrange their ideas and how to present them properly, with emphasis on scientific and technical tools.

Prerequisites: None

ELECTIVE COURSES:

AE351 Geographical Information System

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 2hrs. Exercise

Principles of Geographical Information Systems and their application in urban studies- Methods of establishing statistical databases- Geographical data collection- Computer applications linking statistical and geographical databases- use of software in studying the change in built environment- Applied software.

Prerequisites: None

AE461 Digital Architecture

Credit Hours: 2 Teaching Hours: 2hrs Lecture+ 0 hrs. Exercise

The course tracks the changes in the framework of thought, in both sciences and philosophy. It looks also into the advent of geometry and mathematics (computation), concluding on how mentioned changes and developments contributed to the shift in architectural ideology. It explains why and how ideological shifts occur. It traces the shift in sciences from the

"Newtonian" to "Complexity" paradigms. It examines CADCAM , digital fabrication and customization.

Prerequisites: None

AE465 Landscape Design

Credit Hours: 2 Teaching Hours: 2hrs Lecture+ 0 hrs. Exercise

The course covers a wide range of topics that offer a good understanding of the basic principles and elements of landscape design. It introduces the classification and identification of plants, water and other elements of landscape design to create a site that is pleasing to the senses and that visually, functionally and aesthetically improves the appearance of the landscape at an affordable cost. The course also calls upon solving complex problems with long-term impacts, landscape preservation and resource development and conservation.

Prerequisites: None

AE464 Restoration and Conservation

Credit Hours: 2 Teaching Hours: 2hrs Lecture+ 0 hrs. Exercise

The course introduces the discourse concerning the viability and sustainability of the built heritage. The main emphasis will be on the theories, processes, and policies of the management of building change and decay. The course also explores the various schools of conservation thoughts, their philosophy and ethics of intervention. Thus, the course seeks to frame buildings regeneration within comparative methodologies of building conservation using one or more of the tools and techniques of repair, maintenance, restoration, renovation, rehabilitation, reclamation, reconstruction, redevelopment, preservation, and conservation.

Prerequisites: None

AE336 Furniture Design

Credit Hours: 2 Teaching Hours: 1hr. Lecture+ 2hrs. Exercise

Considering furniture as one of the interior design elements, and as it contribute in the visual character of the internal environment, this course introduces the student into furniture, studying the relationship between it and the human body dimensions with a deep look on the mobile furniture design (chairs, tables, workstations, bed, etc.)

In the second part of this course the student is to study in depth the fixed furniture design (location, Dimensions, and style). For example: Cupboards, wall storage area, fireplaces, bathrooms, and kitchens.

Student should study furniture pieces from his/her graduation project.

Prerequisites: None

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CM 101 Engineering Materials **3[2-2-1]**

Classification of engineering materials, atomic and molecular structure, bonding and coordination. Properties relationship in materials (metals, ceramic glasses and polymers). Corrosion resistant materials, composites and their applications. Properties of alloys and campsites. Testing of materials and selection factors for various applications. The course will focus on metals' properties, standard and quality control testing- Steel, Building stones- Bricks- Timber- Heat insulating and acoustic materials. Laboratory: Testing for QC, sample preparation and testing effect of service conditions on the properties of materials, Testing of materials for strength. Laboratory: evaluation.

CM 102 Structural Analysis-1 **3[2-2-0]**

Structural Types, loads, supports, reactions, internal forces, analysis of beams, frames, trusses. Analysis of beams subjected to moving loads. Influence lines of statically determined structures.

Prerequisites: BE 111, BE 112

CM 103 Introduction to CAD Systems **3[2-0-2]**

The aim of this course is to explore current CAD technologies and develop skills in the use of specialist CAD software to produce 2D and 3D design specifications, to transform CAD drawings into photo realistic virtual products and to gain an awareness of CAD data and how such information can be transformed to engineering drawings. The AutoCAD program. computers and operating system, setting up, drawing-operations, blocks and dimensions. Layers, area limits, view ports, Paper Space, Model Space, X-ref and introduction to 3-D. Printing and plotting. Rectangular, isometric and diametric projections.

Prerequisites: BE 141

CM 104 Civil Engineering Drawing **3[2-0-2]**

Introduction to civil engineering projects, General Concepts, Legend and symbols, Scales and drawing size, General layout and plans, Longitudinal and cross sections, Detailing, Earthworks and retaining walls, Applications on irrigation and land reclamation projects, Half-earth-removed views, Pitching and protection. Drawing of steel sections and connections, reinforced concrete sections. Projection of beams and columns.

Prerequisites: CM 103

CM 105 Introduction to Construction Engineering **3[2-2-0]**

Construction industry and national economy, construction project concepts and characteristics, construction project life cycle, major types of construction, sample construction projects, design and construction integration, innovation, constructability and technological feasibility, organizing for project participants, organization structure and staffing, work breakdown structure, construction quality, safety concerns.

Prerequisites: None

CM 106 Surveying for Engineers **3[2-1-2]**

Engineering principles and applications of surveying sciences (with emphasis on plane surveying) are presented in relation to engineering. Popular techniques and engineering uses of distance, angles and height difference measurements are studied and practiced. Applications in detail mapping, earthwork computations, and setting out engineering structures are covered in this course. Integrated digital surveying and mapping using total station are introduced.

Prerequisites: BE 101

CM 107 Structural Analysis-2 **3[2-2-0]**

Elastic deformations: deferential equations, virtual work. Indeterminate structures: consistent deformation, moment distribution. Buckling of columns, circular plates, rectangular plates, shell structures.

Prerequisites: CM 102

CM 113 Strength of Materials **3[2-2-0]**

Analysis of stress, strain, and deformation of sections subjected to tension, compression, bending, shear, and torsion- Buckling- Theories of failure- Principle stresses, deflection and stiffness of mechanical members.

Prerequisites: BE 112, BE 113

PE 389 Introduction to Environmental Engineering **3[2-2-0]**

Clean environmental standards. Rules and regulations applied to soil, water and air. Sources of environmental pollution, estimation of pollutants in the environment and presentation of suitable schemes for abatement and control. The course unit focuses on the application of engineering principles for producing clean environment. (Same as PE 389)

Prerequisite: none

CM 202 Concrete Materials. **3[2-2-2]**

Examines the properties and influence of constituent materials (cements, aggregates and admixtures) on the properties of fresh and hardened concrete; mix design; handling and placement of concrete; and behavior of concrete under various types of loading and environment; test methods; durability of concrete. Laboratory practice is an integral part of the course.

Prerequisite: CM 101.

CM 203 Construction Project Management **3[2-2-0]**

Project management definition, project delivery methods, contracting

strategies, basic management functions, construction scheduling, bar charts, critical path method, construction resources, material management, labor productivity, construction equipment, design and analysis of construction operations, construction cost, cost estimating, direct and indirect costs, cash flow calculations, introduction to management information systems.

Prerequisite: CM 105

CM 204 Soil Mechanics (1) **3[2-2-1]**

Introduction to geotechnical engineering. Classification of soils, Composition and structure of soil, compaction in the laboratory and in the field, soil exploration, boring and sampling, permeability of soils, one-dimensional settlement analyses, strength of soil, introduction to foundations, fundamentals of retaining structures, slope stability.

Prerequisite: CM 101.

CM 205 Construction Planning and Scheduling **3[2-2-0]**

Project definition; scheduling and control models; material, labor and equipment allocation; optimal schedules; project organization; documentation and reporting systems; and management and control.

Prerequisite: CM 203

CM 206 Reinforced Concrete Design (1) **3[2-2-0]**

The principles of the behaviour of reinforced concrete. Introduction to design codes. Analysis of limit states, (SLS, ULS), design for bending, axial force, shear, torsion and combinations hereof. Detailing of reinforced concrete.

Prerequisite: CM 107, CM 202.