

الوصف المختصر للمواد الدراسية – إجراءات تنفيذ مهام لجنة الخطة الدراسية / قسم الهندسة الميكانيكية / أنظمة التكييف والتبريد	QF09/0409-1.0
Course Brief Description – Procedures of the Course Plan Committee/ Department of Mechanical engineering / Air Conditioning and Refrigeration Systems	

Department	Mechanical engineering / Air Conditioning and Refrigeration Systems Engineering	القسم
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50	عدد المواد الدراسية Number of Courses	2012-2013	تاريخ الاعتماد Approval Date	2	الخطة الدراسية رقم Course Plan No.
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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
-	3	Principles of Energy	0904100

This course aims to teach the students the traditional energy sources: coal, oil shale, oil and its derivatives. Renewable energy sources: solar energy, wind energy, hydrogen production, groundwater energy, biomass energy, and nuclear energy. Energy conservation in buildings appliances and other different sectors.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
-	2	Engineering Workshops	0904101

It covers Carpentry, Welding, electrical installations, model making through milling and lathe.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
-	3	Engineering Drawing	0904102

This course of study aims to teach students the necessary techniques of preparing engineering drawings, reading and interpreting a drawing, and solving three dimensional engineering problems that require the application of graphical analysis using computer aided design and modeling in 2 and 3 dimensions.

المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0102099	1	Computer Applications	0904200

A systematic development of programming via flowcharts and pseudo codes; The course highlights include: assignment, repetition, decision making, arrays, file processing and subprograms in program construction. Program design includes: algorithm design, procedures and data program structure, module design, programming standards, program documentation, testing, debugging, verification and validation, file organization and processing, array processing, abstract data structures, data driven programs and simulation. Matlab language will be used. Homework problems and projects of direct engineering applications will be assigned.

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0902211	3	Dynamics	0904211
Kinematics of particles; Rectilinear and curvilinear motion in various coordinate systems. Kinetics of particles; Newton's second law, Central force motion, Work-energy equation, Principle of impulse and momentum, Impact, Conservation of energy and momentum, Application to a system of particles. Kinematics of rigid bodies; Relative velocity and acceleration, Instantaneous center, Analysis in terms of a parameter. Plane kinetics of rigid bodies with application of Newton's second law, Energy and impulse-momentum.			
0902214	3	Strength of Materials	0904212
Axial loading, Material properties obtained from tensile tests, Stresses and strains due to axial loading, Thermal Stresses, Elementary theory of torsion, Solid and hollow shafts, Thin-walled tubes, Rectangular cross-section, Stresses in beams due to bending, shear and combined forces. Composite beams, Analysis of plane stress, Mohr's Circle, Combined stresses, Thin-walled pressure vessels, Deflection of beams, Buckling of columns, Energy Methods.			
Co. 0904212	3	Strength of Materials Lab.	0904213
This laboratory serves mainly the measuring and/or determination of some material properties (strain and stress, yield stress, ultimate stress, fracture stress). Non destructive testing of materials (NDT), micro and macro examination of materials and phase diagrams for steel. It is equipped with machines for conducting tests, such as: Tension, impact fatigue, bending, creep, hardness, and photo elasticity tests.			
0104116	2	Materials Sciences	0904214
Bonding forces and energies. Classification of engineering materials. Crystallography. X-ray diffraction. Imperfection in solids and strengthening mechanisms. Diffusion. Metallography. Mechanical properties of materials. Material testing evaluation and failure. Thermal equilibrium diagram. Corrosion of metals and their protection. Case studies in material selection. Relative cost of materials.			
0904102	1	Machine Drawing	0209042
Mechanical engineering drawing conventions and abbreviations, various systems of size description, including precision dimensioning, fastening elements, standard organization and preparation of engineering drawings, assembly and detailed drawings, design applications.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0103102	3	Thermodynamics (1)	0904231
Thermodynamic concepts and definitions, states, properties, systems, control volume; processes, cycles, and units; pure substances, equation of states, table of properties; work and heat; the first law, internal energy and enthalpy; conservation of mass; SSSF and USUF processes; the second law, heat engines and refrigerators, reversible processes, Carnot cycle; entropy, Clausius inequality, principle of the increase of entropy, Efficiencies.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0101271	3	Numerical Methods for Engineering students	0904300
Roots of nonlinear equations (fixed point, Newton, secant, bisection). Condition number of linear systems. Iterative methods for linear and non-linear systems (Gauss-Seidel, Gauss-Jacobi, SOR; fixed point, Newton). Interpolation and polynomial approximation. Eigenvalue methods. Spline interpolation, numerical differentiation and integration. Numerical methods for differential equations. Random number generators. Error analysis.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904211 0904320,	3	Mechanical Vibrations	0904311
Simple harmonic motion. Elements of vibratory systems. Systems with single degree of freedom and applications; damped free vibration, rotating and reciprocating unbalance, vibration isolation and transmissibility, and period excitation, systems with multiple degrees of freedom and applications, methods of finding natural frequencies.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904350 0904360,	3	Engineering Measurements	0904312
Report writing, basics of metrology, inspection and measurements. Errors & error analysis, uncertainty analysis, statistical methods, least squares method. Basics of transducers. Static and dynamic characteristics of systems. Measurement of flow, pressure, and temperature. Strain gauges, strain rosettes			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904312	1	Engineering Measurements Lab.	0904313
Experimental methods on the following systems: pressure measurement, flow measurement, temperature measurement, strain gauges, strain rosettes.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904212	3	Design of Machine Elements	0904320
Review of stress, analysis. Theories of failure. Power transmission shafts. Tension and shear. Connections and selection of bolts. Helical tension and compression spring design. Weld analysis and design. Selection of rolling element bearings. Gears geometry, Force and stress analysis. Mechanical couplings. Flexible power transmission elements.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904231	3	Thermodynamics (2)	0904330
Review of basic laws and principles. Irreversibility and availability, Vapor and air power and refrigeration cycles. Mixtures of real gases and vapors. Psychrometry. Combustion. Elementary chemical kinetics			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904330	3	Thermodynamics Lab.	0904331
Experimental methods in the following : Mechanical equivalent of heat; The adiabatic exponent; Marcet boiler; Bomb calorimeter; Flow through nozzle; Refrigeration system; Air conditioning system; Heat pump and air cooler; single stage air compressor; cooling tower; Thermic unit (steam turbine power plant).			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904211 0101104,	3	Fluid Mechanics (1)	0904350
Introduction, Fluid properties, Basic units. Fluid statics, Pressure and its measurements, Forces on plane and curved submerged surfaces, buoyancy & floatation, Fluids in motion, Flow kinematics and visualization, Basic control volume approach, Differential and integral continuity equation. Pressure variation in flowing fluids, Euler's and Bernoulli's equations, Applications of Bernoulli equation. Momentum principle and its applications, Navier-Stokes equations. Energy equation, Hydraulic and energy grade lines. Dimensional analysis and similitude. Surface resistance and introduction to boundary layer theory. Flow in conduits, laminar and turbulent flows, Frictional and minor losses, Piping systems.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904350	1	Fluid Mechanics Lab.	0904351
Experimental methods in the following systems: center of pressure; impulse momentum principle; pumps, friction losses in pipes, stream lines and flow fields, buoyancy and boundary layer theory. Radial flow fan, Water turbine, Flow measurement.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904211	3	System Dynamics and Control	0904360
Review of complex variables and Laplace transform .Poles and element transfer function and block diagram. Modeling of physical systems; electrical, mechanical, hydraulic and pneumatic systems. Linearization of nonlinear systems. System representations. Thermal, System block diagrams and signal flow graphs. Overall transfer function, block diagrams reduction techniques and Mason's gain formula. Time response analysis and performance indices of first and second order systems. Dominate poles of high order systems. Routh-hurwitz stability criterion. Stability analysis using root locus. Bode diagrams and Nyquist stability criterion. Introduction to analysis using state-space equations.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904360	3	Control Lab.	0904361
The lab consists of experiments that are related to: First and second order system analysis control experiments. Servo systems. Stability of dynamical systems. System identification. Design and tuning of a PID controller in closed loop systems. Simulation of systems using Simulink or Matlab.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
4 <sup>th</sup> year	3	Engineering Economics	0904400
Applies planning, analysis, control, and engineering economic models to life cycle of physical infrastructure. Introduces infrastructure design process and application of quantitative and probabilistic models. Presents applications of model building for engineering economics; decision making; forecasting; resource scheduling and allocation; estimating; work measurement and materials; and quality and process control in water, transportation, environmental, energy, and telecommunications infrastructure systems and the built environment.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904350	3	Heat Transfer (1)	0904431
Introduction to modes of heat transfer; one-dimensional steady state conduction; unsteady state conduction, lumped heat capacity system; introduction to convection, flow and thermal boundary layers. Laminar and turbulent boundary layers; convection in internal and external flows; empirical relations for forced convection heat transfer; natural convection systems; condensation and boiling; introduction to thermal radiation.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
,0904430 0904330	3	Air Conditioning and Refrigeration Systems (1)	0904432
Review of psychrometry; thermal comfort; air conditioning processes; inside and outside design conditions; heating load calculations, infiltration; cooling load calculations, solar gain; heating systems, design, layout; hot water, steam, hot air systems; under floor heating.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904433	1	Heat Transfer Lab.	0904432
Experimental work in heat transfer covering: Measurement of thermal conductivity, Natural and forced convection, Radiation, Boiling and condensation. Heat exchangers.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904430	3	Heat Transfer (2)	0904433
Review of basic concepts; radiation properties and processes; radiation exchange among surfaces; two dimensional steady state conduction; analytical, graphical, and numerical solutions; one-dimensional transient conduction; topics in convective heat transfer; exact and approximate problem solutions, combined entry length solution in pipe flow; heat transfer in turbulent and high speed flows; liquid metal heat transfer; freezing, melting, heat-pipe heat transfer; multimode heat transfer.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904350	3	Gas Dynamic	0904450
Basic equation of compressible flow ,wave propagation in compressible media , isentropic flow of a perfect gas , normal shock waves , oblique shock waves , prandtl-meyer flow , flow with friction , flow with heat addition .			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904350 0904360,	3	Design Hydraulic and Pneumatic Control Systems	0904520
The objective of this course is to familiarize student with fluid power systems design control and operation. It covers the fundamentals of fluid flow, modeling and n port concepts, fluid power modulation, static and dynamic modeling of pumps, motor, control valves, transmission lines and fluid drives. It also deals with design control and operation of mechanical and electrical hydraulic servodrives with feedback. Emphasis is placed on linear hydraulic systems behavior.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Co. 0904520	3	Design Hydraulic and Pneumatic Control Systems Lab	0904521
The lab consists of experiments that are related to: fluid power systems design control and operation. Fundamentals of fluid flow, modeling and n port concepts, fluid power modulation, static and dynamic modeling of pumps, motor, control valves, transmission lines and fluid drives. It also deals with design control and operation of mechanical and electrical hydraulic servodrives with feedback. Emphasis is placed on linear hydraulic systems behavior.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904320	3	Computer-Aided Design	0904522
Fundamentals of Hardware and Software. Techniques for Geometric Modeling (Line, Surface and Volume Modeling). Elements of Interactive Computer Graphics. Entity Manipulation. Introduction to Finite Element Techniques. Using in-house software: Introduction to Graphics User Interface, Sketcher Environment, Parametric & Feature-Based Solid Modeling, Surface Modeling, Concept of Parent/Child Relationships, Part Construction Techniques, Patterns, Advanced Features, Cross-Sections, Parametric Relations, Component Assembly Techniques,			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904431	3	Air Conditioning and Refrigeration Systems (2)	0904530
Review of psychrometry; analysis of inside and outside design conditions; low speed air conditioning systems; cooling coils, basic cooling load analysis; by-pass systems; single duct, double and multi-duct systems; unit location and position funding; duct design, fans, energy; ventilation; control systems.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904330	3	Thermal Power systems	0904534
Review of power cycles related to steam and gas turbine power plants; types and characteristics of steam power plants including various plant components; water treatment; corrosion; load management; power plant economics. Environmental aspects.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904433	3	Solar Energy	0904543
Fundamentals of solar radiation; methods of solar radiation collection; thermal systems components and analysis; transfer of collected heat; storage of collected heat; domestic hot water system; introduction to solar energy applications.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
,0904330 0904430	3	Green Building	0904544
The purpose of this course is to provide construction professionals with information that will help them to effectively bid, contract, build and close out green building projects. We will explore the green building process from the contractor's and subcontractor's point of view. Know how green building impacts material and equipment procurement. Understand how construction scheduling and sequencing is impacted by green building .Be familiar with the risks imposed by green construction			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904530	3	Energy Conversion	0904547
Energy classification, sources and utilization; Energy growth and economics; Fossil-Fuel Systems and combustion in steam power plants. Steam generators. Boiler rating and performance.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904350	3	Fluid Mechanics (2)	0904551
Review of basic definitions; system and control volume; Foundations of flow analysis; differential from of the basic laws; general viscous flow; boundary layer theory, Navier – Stokes equation, Blassius equation, Von Karman equation, Irrotational flow; stream function, vorticity and rotationality, Incompressible inviscid frictionless flow, 2-D Flow solutions around bodies, compressible flow; adiabatic and isentropic flow; Normal shock waves; Nozzles; Introduction to turbomachinery, centrifugal pumps			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
,0904431 0904360	3	Control Application in Air Conditioning and Refrigeration	0904560
The study of control loop theory related to commercial and industrial comfort, process and safety applications. The course focuses on analog electronic and pneumatic control components and their systems used in new and existing installations.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Passing 120 credit hours	–	Applied Engineering Training	0904570
The student has to spend at least 8 weeks of mechanical engineering training at recognized companies and establishments during the summer semester.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
Passing 120 credit hours	1	Final Year Project I	0904571
A supervised project in groups of normally two students aimed at providing practical experience in some aspect of civil and infrastructure engineering. Students are expected to complete a literature survey, project specification, critical analysis, and to acquire the necessary material needed for their intended end product.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904571	2	Final Year Project II	0904572
This is a continuity of the final project I, consequently the students are expected to successfully accomplish the final year project in the specified field of project I.			



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5 <sup>th</sup> year	3	Special Topic	0904573
Vary with nature of topic. Topics of special interest to undergraduates. May be repeated for maximum 6 credits if topics are substantially different, which is subjected to departmental approval.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0103101	3	Engineering Mechanics	0904215
Force systems; resultant, moment of a force, equivalent forcecouple system. Particle and rigid body equilibrium in one plane. Trusses and Frames. Beams; shear force and bending moment diagrams. Center of gravity and centroid. Area moment of inertia. Planar kinematics and kinetics (Newton's second Law and workenergy method) of particles and rigid bodies in rectilinear and curvilinear motion (normal and tangential coordinates).			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0103102	3	Engineering Thermodynamics	0904230
Introduces classical concepts of energy and temperature, first and second laws and their application to close and open thermodynamic systems, covers properties of pure substances, equation of state, and analysis of thermodynamic processes, and systems, power and refrigeration cycles.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904333	3	Mechanical Systems	0904310
mechanical systems, which include vertical and horizontal transportation systems and fire fighting systems, systems such as private yards, fountains and irrigation systems and building systems to provide hot and cold water in addition to health systems, drainage and sewage, which includes systems for supplying power and lighting and early warning anti-fire system and communications in addition to the control system and power plant system for the secondary.			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904230	3	Principles of Heating and Air Conditioning	0904333
HVAC is sometimes referred to as climate control and is particularly important in the design of medium to large industrial and office buildings such as skyscrapers and in marine environments such			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
103102	3	Fluid Mechanics for Non mechanical Students	0904352
Describes the laws of liquid and gas motion, atmospheric circulation, oceanic currents, flows in water and air within conduits, and various fittings. Wind loads on buildings and structures.			

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المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904333	3	Principles of environmental control	0904434
<p>the basic elements of the climate, which affected the lives and comfort of humans in the environmental that exists in it and it is addressed to the temperature and humidity needed by the human in the environmental, who works and lives it through the work of the balance between external influences and their transition into the buildings . the influence of temperature and humidity, and methods of their formation and spread into the Origin is coming through the architectural elements and building materials used, so be clear to the students ways to use solar energy and the protection systems of solar radiation study of the movement of air inside buildings (ventilation) and cooling by evaporation and the time delay factor and lack of a study by traditional methods to control the heat in different climatic zones.</p>			
المتطلب السابق Prerequisite	الساعات المعتمدة Credit Hours	اسم المادة الدراسية Course Name	رقم المادة Course No.
0904352	3	Sanitary and waste water systems	0904353
<p>Sanitary systems, basic definitions, water sources, properties and methods of treatment of drinking / specifications, water systems, cold and hot, design, valves, and testing of materials used in plumbing and types, sanitation, buildings (internal and external), the ventilation systems in the drainage health, drainage system, rain, fire systems in buildings.</p>			

Approved by	(التوقيع والخاتم الرسمي)	اعتمدت من قبل مجلس القسم
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