

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Faculty	Engineering and Technology	Academic Department	Alternative Energy Technology	Number of the course plan ( )
Number of Major requirement courses	31	Date of plan approval		

This form is just for the major requirement courses

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906100	3	Principles of energy sciences	-

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.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906201	3	Workshop and occupational safety	-

This course concentrates on safety management as it relates to hazard identification, accident investigation and training, enabling the safety manager to reduce costs to business, industry, and government. This course also covers labor laws in general and the Jordanian labor law in specific.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906210	3	Electrical machines and power systems	0905111

Newton's law of rotation, magnetic fields and circuits, Faraday's law, real reactive and apparent power, three-phase circuits, delta wye connections, one-line diagrams, power triangle, ideal transformers, per-unit system, three-phase transformers, magnetomotive force, stator, rotor, synchronous generators and motors, induction motors, DC motors, two-wire transmission line, power system equations.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906213	1	Electrical circuit lab	0905111

DC circuits, Kirchhoff voltage law, Kirchhoff current law, Thevenin and Norton theorems, superposition theorem, RL circuits, RC circuits, RLC circuits, Series and parallel resonance, quality factor, impedance, power and power factor.

Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906220	3	Engineering mechanics	0120131 0911102

This course covers the following topics: Mechanics, Newton's laws, Forces, Rectangular components, Cartesian Components, Vector addition, Varignon Theorem, Moment, Couple, Resultant, Two-dimensional force systems, three-dimensional force systems, Moment and couple, Equilibrium conditions, Plane trusses, Method of Joint, 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.

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906225	2	Thermodynamics	0120131
This course covers the following topics: Defining and describing systems and their behavior, Energy and the first law of thermodynamics. Ideal gas law & ideal gas properties. First law Analysis for a control volume: Development of equations for conservation of mass and energy. Introduction to second law of thermodynamics. Gas power cycles and Refrigeration Cycle.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906211	1	Electrical machines and power systems lab	0906210
Delta-star connections, measurement of voltage-current-power, single phase transformers, autotransformers, three phase transformers, synchronous transformers, three phase induction motors, shunt DC motors, series DC motors, transmission lines.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906223	2	Fluid mechanics	0120131
This course covers the following topics: General Introduction – Introduction – Fluid Properties – Fluid Statics - Flowing Fluids and Pressure Variation - Control Volume Approach and Continuity Equation – Momentum Equation – Energy Equation - Dimensional Analysis and Similitude - Flow in conduits: Laminar and Turbulent pipe flow -Turbomachinery			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906314	3	Instrumentations and measurements	0906223 0905111
Units, dimensions and standards, uncertainty analysis, error measurements, statistical analysis, sensor calibration, noise sources, signal conditioning, amplifiers, op-amps, low pass and high pass filters, thermistor, thermocouple, RTD, diaphragms, bellows, manometers, mass-flow rate, volume-flow rate, LVDT, piezoelectric sensors, strain gauges, accelerometers, optical sensors, instrumentation transformer.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906323	3	Strength of materials	0906220
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.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906325	2	Heat transfer	0906225
This course covers the following topics: Topics to be covered include heat conduction in one dimension and multi dimensions, steady and unsteady conductions, natural convection in internal and external configurations, forced convection in laminar and turbulent flows; heat transfer during condensation and boiling; introduction to thermal radiation.			

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906230	3	Conventional energy resources	0120131
This course covers the following topics: Introduction to energy source and Quality of energy, Types of most common conventional fuels: coal, natural gas, oil shale and petroleum products, gasification processes. Current proven reserves of fossil fuels. Economy of fossil fuels. Environmental impacts of fossil fuels and calculating the heating value.			
0906316	3	Electronics circuits	0905111
Semiconductors and PN junctions, diodes and applications, special purpose diodes, single and three phase rectifiers, field-effect transistor (FET) and biasing, regulators, single and three phase inverters, bipolar junction transistors (BJTs) and bias circuits, power amplifiers, op-amps.			
0906335	3	Combustion processes	0906225
The course discuss the principal concepts of combustion theory, the chemical combustion reactions, the boilers combustion, the Internal combustion engine, the four stroke engine , the two stroke engine, the Wankel engine, the Otto cycle, the Diesel cycle , the actual engine cycle, the engine performance characteristics, the turbocharged and compound Diesel, the engine exhaust and intake			
0906344	3	Solar thermal energy workshop	0906325
carry out experiments in Solar thermal circuits , Study solar angles, heat balance , thermal efficiency, control of thermal circuits , irradiance, heat exchanger , pumps, effect of coating material, control of the thermal circuits, evacuated tubes design , CSP system design.			
0906345	3	Solar Electric PV Energy Workshop	0905111
This course concentrates on safety management as it relates to hazard identification, accident investigation and training, enabling the safety manager to reduce costs to business, industry, and government. This course also covers labor laws in general and the Jordanian labor law in specific.			
0906302	3	Simulation and modeling lab	0909101
This course covers factors important in the understanding, design, simulation and characterization of PV systems and energy components of Buildings by using PVsyst & Transys software.			
<ul style="list-style-type: none"> <li>- The PVsyst software uses extensive knowledge of PV technology, meteorological irradiation resources and PV components.</li> <li>- Transys is a complete and extensible software environment for the transient simulation of systems, including multi-zone buildings. It is used to solved the equations related to energy by dividing the buildings into split thermal zones and calculating all energy flow forms</li> </ul>			

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906317	1	Electronics circuits lab	0906316
Diodes and its characteristics, Zener diodes, half-wave and full wave rectifiers, three-phase rectifiers, FET transistors, FET switching, regulators, inverters, power amplifiers, op-amps.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906336	3	Energy conversion	0906230
This course covers the following topics: Energy sources and their classification. Conventional energy conservation: Power plant and vapor cycles. Renewable energy: Solar energy with emphasis on solar cells, and wind energy, geothermal energy. Nuclear fission and types of fission reactors.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906334	1	Combustion lab	0906335
This course elaborates on the fundamentals of internal combustion engines and what affects their performance, operation, fuel requirements and environmental impact. Internal combustion engines may be classified according to: cycle of operation (two-strokes & four strokes engine), cycle of combustion (Otto, Diesel & dual cycle engine), method of ignition (Spark ignition (S.I) engine & Compression ignition (C.I) engine). This lab aims to study the engine operating characteristics (work, pressure, torque, power, air-fuel ratio, fuel consumption, efficiency, emission & volumetric efficiency) for various types of engines.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906346	3	Alternative energy (1)	0906325
This course covers the following topics: The need for alternate energy sources, Solar Radiation: Concepts, Measurements, Site assessment and solar angle. Potential of solar ( PV or Thermal and CSP) and wind options, Measurement of solar radiation, Tracking surfaces, Direct, sky diffuse and ground reflected components, Introduction to photovoltaic (PV) systems. Solar energy potential for PV, irradiance, solar radiation and spectrum of sun, Photovoltaic effect, conversion of solar energy into electrical energy, behavior of solar cells, Solar cells, basic structure and characteristics: Single-crystalline, multicrystalline, thin film silicon solar cells, emerging new technologies and sizing of off-grid PV systems. Solar collector; manufacturing and working principle, CSP technology; parabolic trough collector PTC Linear Fresnel reflector LFR, Solar tower / central receiver, solar dish and Hydropower electricity.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906434	2	Energy Economics and Management	0906346
Introduction to engineering management of new products; management of manufacturing processes; management of the linkages between new products and manufacturing processes. Current theories; concepts and techniques are stressed; using a combination of readings; cases and guest speakers. Strategies and economic factors of renewable energy policies worldwide. The course examines policy drivers; including environmental impact; community service obligations and industrial/technological developments; as well as policy and financial instruments. The policies; economic analysis and strategies are illustrated with international case studies for renewable energy programs.			

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906448	3	Alternative energy (2)	0906346
<p>This course covers the following topics: Origin of Wind, Local effects; Wind shear, Turbulence, Acceleration effects, Time variation. Measurement of wind; Ecological indicators, Anemometers (different Types, Analysis of wind data, Average wind Speed, Distribution of wind speed and Energy Estimation of wind regime.</p> <p>Fuel cell technology, Geothermal energy and Parabolic trough collector; Collector geometry, Sun Tracking System, Receiver efficiency, Heat transfer fluid, Power plant integration and Efficiency of parabolic trough power plants.</p>			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906449	2	Bioenergy and waste management workshop	0906230
<p>Chemistry &amp; Biochemistry of biomass, Biodiesel, Bio-Methane, Bio-Ethanol &amp; Bio Hydrogen, Bio-Energy Systems, Direct Biomass Combustion &amp; Co-firing Technologies, Gasification &amp; pyrolysis Technologies, Analysis and evaluation of the Biotechnologies and policies and future of Bio-fuels and Bio-Energy. Environmental aspects of biofuel production; economics and life-cycle analysis of biofuel; value adding of biofuel residues; case studies on biofuel production.</p>			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906454	3	Wind energy workshop	0906346
<p>This course covers the following topics: Introduces the students to wind turbine systems, including wind energy potential and application to power generation. Topics include wind energy principles, wind site assessment, wind turbine components, power generation machinery, control systems, connection to the electric grid, and maintenance</p>			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906301	6	Industrial training	Passing 90 credit
<p>A continuous period of twelve weeks of summer training spent in the industry working in any of the fields of renewable energy technology. The training should be carried out in an organization with an interest in one or more of these fields. On completion of the program, the student is required to submit a formal written report of his work.</p>			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906404	3	Energy efficiency workshop	0906434 0906336
<p>Energy management principles; energy conservation; energy auditing; analysis; formulation of energy management options; economic evaluation, implementation &amp; control; energy conservation techniques – conservation in energy intensive industries; integrated resource planning; demand-side management; cogeneration; total energy schemes; thermal insulation; energy storage; economic evaluation of conservation technologies; analysis of typical applications. Energy law and regulation in Jordan and Worldwide</p>			

Brief course description- Course Plan Development and Updating Procedures\ Alternative Energy Technology Department	QF09/0409-3.0E
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Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906433	2	Environmental pollution	0906335
Primary and secondary pollution, air and water pollution, depletion of ozone layer, global warming; methods of environmental impact assessment. Prototype carbon funds, carbon credits and trading, benefits to developing countries			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906455	2	Hybrid systems Workshops	0906345
This course covers the following topics: Introduction to Hybrid systems and describing the Renewable energy systems and technology, Solar panel characteristics, Wind turbine power curve, Fuel cell, Off-grid renewable energy system, Hydraulic turbo machine & different types of turbine that used for wind and hydropower system.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906401	1	Graduation project I	Passing 90 credit
Senior design project course. Principles of technological design process. Small groups of students tackle the complete design of an industry solicited or one similar project. Design ideation iteration, and analysis. Project management- planning and budgeting. Engineering ethics and safety. Oral and written communications. A supervised project in groups of normally two students aimed at providing practical experience in some aspect of alternative renewable energy. Students are expected to complete a literature survey, project specification, critical analysis, and to acquire the necessary material needed for their intended end product			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906402	2	Graduation project II	0906401
A continuation of 0906401 with the same team. This course is a continuation of the project selected under the supervision of the same project client and advisor. Design iteration, analysis, implementation or fabrication and testing.			
Course number	Credit hours	Title of the course	Prerequisite-co-requisite
0906430	2	Power plants	0906225
Generation of electric power using fossil, nuclear and renewable, including solar, geothermal, wind, hydroelectric, biomass and ocean. Power plant thermal cycle analysis. Cogeneration and combined cycles. Economics, operations, and design of electric power stations. Conventional power plants, nuclear plant, different solar power plants hydroelectric plants and wind plants.			

Approved by department council	Dr. Ali Othman	Date of approval	10/03/2018
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