



كلية الهندسة التكنولوجية



جامعة البلقاء التطبيقية

الخطط الدراسية لبرنامج الشهادة

الجامعية المتوسطة

تخصص محطات التوليد

2008/2009



بإشرافه عميد الكلية الأستاذ الدكتور قاسم جابر

Curriculum for Associate Degree Program in Power Plants Specialization

The curriculum of associate degree in “Power Plants” specialization consists of (72 credit hours) as follows:

Serial No.	Requirements	Credit Hours
First	University Requirements	12
Second	Engineering Program Requirements	17
Third	Specialization Requirements	43
Total		72



**The curriculum of associate degree
in
Power Plants Specialization**

First: University requirements (12 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
22001101	Arabic Language	3	3	-	
22002101	English Language	3	3	-	
21901100	Islamic Culture	3	3	-	
21702101	Computer Skills	3	1	4	
Total		12	10	4	

Second: Engineering program requirements (17 credit hours) as follow:

Course No	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20201111	Engineering Workshops	1	-	3	-
20204111	AutoCAD	2	-	6	-
20506111	Occupational Safety	2	2	-	-
21301111	General Mathematics	3	2	2	-
21302111	General Physics	3	2	2	-
21302112	General Physics Laboratory	1	-	3	-
21702111	Communication Skills and Technical Writing	3	2	2	22002101
20201121	Engineering Materials	2	2	-	-
Total		17	10	18	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Third: Specialization Requirements (43 credit hours) as follows:

Course No.	Course Title	Credit Hours	Weekly Contact Hours		Prerequisite
			Theoretical	Practical	
20301111	Electricity and Electronics	2	2	0	21302111*
20301112	Electricity and electronics Laboratory	1	0	3	20301113*
20207121	Mechanics	3	3	0	21302111
20209111	Thermal Engineering	3	3	0	21302111*
20209112	Thermal Engineering Laboratory	1	0	3	20209111*
20204211	Mechanical Drawing	2	0	6	20204111
20207111	Fluids and Hydraulic Machines	3	3	0	21302111*
20207112	Fluids and Hydraulic Machines Lab.	1	0	3	20207111*
20207131	Internal Combustion Engines	3	3	0	20209111
20207132	Internal Combustion Engines Lab.	1	0	3	20207131*
20206211	Steam Generation	3	3	0	20209111
20206212	Steam Generation Lab.	1	0	3	20206212*
20206221	Power Plants 1	3	3	0	20206211*
20206222	Power Plants 1 Lab.	1	0	3	20206221*
20206223	Power Plants 2	3	3	0	20206221
20206224	Power Plants 2 Lab.	2	0	6	20206223*
20206231	Auxiliary Systems for Power Plants	3	3	0	20206223*
20206232	Auxiliary Systems for Power Plants Lab.	1	0	3	20206231*
20206291	Training**	3	0	-	-
20206292	Project	3	0	-	-
Total		43	26	33	

*-Co-requisite

** Equivalent to 280 training hours

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Guiding Plan

First Year					
First Semester			Second Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
22001101	Arabic Language	3	20207111	Fluids and Hydraulic Machines	3
21302111	General Physics	3	20207112	Fluids and Hydraulic Machines Lab.	1
21302112	General Physics Lab	1	22002101	English Language	3
21702101	Computer Skills	3	20207121	Mechanics	3
21301111	General Mathematics	3	20204111	AutoCAD	2
20201121	Engineering Materials	2	20506111	Occupational Safety	2
			20209111	Thermal engineering	3
21901100	Islamic Culture	3	20201111	Engineering Workshops	1
Total		18	Total		18

Second Year					
Third Semester			Fourth Semester		
Course ID	Course Name	Credit Hours	Course ID	Course Name	Credit Hours
20204211	Mechanical Drawing	2	20206223	Power Plants 2	3
20207131	Internal Combustion Engines	3	20206224	Power Plants 2 Lab.	2
20207132	Internal Combustion Engines Lab.	1	20206231	Auxiliary Systems for Power Plants	3
20206211	Steam Generation	3	20206232	Auxiliary Systems for Power Plants Lab.	1
20206212	Steam Generation Lab.	1	20206291	Training	3
20206221	Power Plants 1	3	20206292	Project	3
20209112	Thermal Engineering Lab	1	20301111	Electricity and Electronics	2
21702111	Communication Skills and Technical Writing	3	20301112	Electricity and electronics Lab	1
20206222	Power Plants 1 Lab.	1			
Total		18	Total		18

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description

University Requirements

Course Title	Course No	Credit Hours (Theoretical /Practical)
Arabic Language	22001101	3 (3-0)
<p>تتضمن هذه المادة مجموعة من المهارات اللغوية بمستوياتها وأنظمتها المختلفة: الصوتية، والصرفية، والنحوية، والبلاغية، والمعجمية، والتعبيرية، وتشتمل نماذج من النصوص المشرفة: قرآنية، وشعرية، وقصصية، من بينها نماذج من الأدب الأردني؛ يتوخى من قراءتها وتدوقها وتحليلها تحليلاً أدبياً؛ تنمية الذوق الجمالي لدى الطلاب الدارسين.</p>		
English Language	22002101	3 (3-0)
<p>English 1 is a general course. It covers the syllabuses of listening, speaking, reading, writing, pronunciation and grammar, which are provided in a communicative context. The course is designed for foreign learners of the English language, who have had more than one year of English language study. The extension part would be dealt with in the class situation following the individual differences.</p>		
Islamic Culture	21901100	3 (3-0)
<ol style="list-style-type: none"> 1. تعريف الثقافة الإسلامية وبيان معانيها وموضوعاتها والنظم المتعلقة بها – وظائفها وأهدافها. 2. مصادر ومقومات الثقافة الإسلامية والأركان والأسس التي تقوم عليها. 3. خصائص الثقافة الإسلامية. 4. الإسلام والعلم، والعلاقة بين العلم والإيمان 5. التحديات التي تواجه الثقافة الإسلامية. 6. رد الشبهات التي تثار حول الإسلام. 7. الأخلاق الإسلامية والآداب الشرعية في إطار الثقافة الإسلامية. 8. النظم الإسلامية. 		
Computer Skills	21702101	3 (1-4)
<p>An introduction to computing and the broad field of information technology is given. Topics covered include the basic structure of digital computer system, microcomputer, operating systems, application software, data communication and networks, and the internet. Hands-on learning emphasizes Windows xp, MS-office2000, and the internet.</p>		

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Engineering Program requirements

Engineering Workshops	20201111	1 (0-3)
Development of basic manual skills in Mechanical and Electrical works. Use of manual tools and measuring devices. Hand filing, welding, metal cutting and forming. Electrical wiring.		
AutoCAD	20204111	2 (0-6)
Introduction to AutoCAD, application of AutoCAD, commands, geometric entities. Geometric construction. Dimensioning, free –hand sketching, object representation, orthographic drawing and projections.		
Occupational safety	20506111	2 (2-0)
Role of technicians in economic development First aid accident prevention. Protective devices and equipment. Industrial safety standards. Nature of fire hazards. Sand fire regulations. Physiological effects of electrical shock on human body. First aid and treatment for the effects of electric shock. Rules of spare and chemicals storage and handing.		
Communication Skills and Technical Writing	21702111	3 (2-2)
The main goal of this course is to equip the students with the necessary communication skills in everyday life & work situations and improve their abilities in technical writing to meet market needs. For this course, the English language is the language of teaching & the means of communication for all classroom situations.		
Engineering Materials	20201121	2 (2-0)
Definition of engineering materials. Classification of materials and their properties. Metallic and non-metallic materials. Metals, alloys and composite materials. Conductors, insulators and semiconductors. Mechanical, Magnetic, Thermal and electrical characteristics of materials. Industrial applications of different types of materials.		
General Mathematics	21301111	3 (2-2)
Real numbers coordinate planes, lines, distance and circles. Functions: (operations and graphs on functions), limits, continuity, limits and continuity of trigonometric functions. Exponential and logarithmic functions. Differentiation (techniques of differentiation, chain rule, implicit differentiation). Application of differentiation (increase, decrease, concavity). Graphs of polynomials. Applications: Rolle's Theorem and Mean-Value Theorem, Integration (by substitution, definite integral, fundamental theorem of Calculus). Application of definite integral (area between two curves, volumes)		
General Physics	21302111	3 (2-2)
The physical concepts to be studied includes: vectors, motion in one dimension, motion in two dimensions, the laws of motion, applications of Newton's laws, circular motion, energy and energy transfer, potential energy, linear momentum, electricity, electrical potential, capacitance, current and resistance .		
General Physics lab	21302112	1 (0-3)
In this course, the student performs thirteen experiments in mechanics and in electricity.		

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Specialization Requirements

Electricity and Electronics	20301111	2 (2-0)
Concepts and definitions, electrical circuit elements, voltage, current, resistance, capacitance and inductance, ohms law and dc circuit Calculations. Ac Circuits. Three phase circuits, transformers, and electrical machines. Basic electronic devices and circuits. Introduction to electrical protection.		
Electricity and Electronics Lab.	20301112	1 (0-3)
DC and AC circuits. Current and voltage measurements. Simple electronic circuits. DC and AC machines. Single-phase transformers. Protection devices and circuits.		
Mechanics	20207121	3 (3-0)
Basic definitions and concepts. SI units. Equilibrium. Free body diagrams. Simple structural analysis. Internal forces. Friction. Moment of inertia. Kinematics of particles.		
Fluids and Hydraulic Machines	20207111	3 (3-0)
Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types, Selection and application of pumps.		
Fluids and Hydraulic Machines Lab.	20207112	1 (0-3)
Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.		
Thermal Engineering	20209111	3 (3-0)
Concepts and definitions, Properties of a pure substance, Work and heat, the first law of thermodynamics, the second law of thermodynamics, Principles of heat transfer Steady state conduction, Radiation, Heat exchangers		
Thermal Engineering Lab.	20209112	1 (0-3)
Pressure – Temperature relation in the saturation region; Compressor cycles and analyses; Heat pump performance; Conduction heat transfer; Radiation heat transfer; and Heat exchanger performance		
Mechanical Drawing	20204211	2 (0-6)
The course is designed to develop the technical sense for the student and enable him to create and analyze the different mechanical parts, pipes and ducts, mechanical and HVAC symbols . Assembly and detailed drawings for technical arrangements. Applications for CAD and Solid Works modeling.		

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Internal Combustion Engines	20207131	3 (3-0)
Definition and introduction to the (ICE) fundamentals of engine, operation engine types and classification, engine construction, engine measurements and performance, engine system (lubrication, cooling, fuel) Including both carburetor and electronic fuel injection system .		
Internal Combustion Engines Lab.	20207132	1 (0-3)
Performance tests for spark and compression engines, air and fuel consumption, air fuel ratio bake and indicated horse power. Specific fuel consumption, volumetric efficiency energy balance, variable compression ratio rest engine emission, diagnostic, adjustment of engine.		
Steam Generation	20206211	3 (3-0)
Basic understanding of main parts and operation of steam boilers for different applications. Properties of a pure substance. Main components and accessories. Fuels and combustion. Boiler performance. Operation and maintenance.		
Steam Generation Lab.	20206212	1 (0-3)
Experiments on steam generator parts and components, operation, water treatment unit, boiler efficiency.		
Power Plants 1	20206221	3 (3-0)
Classification of power plants, steam power plants, Rankine cycle, reheat and regeneration, condensers, pumps and piping networks, types of steam turbines, water desalination and treatment units, operation and maintenance of steam power plants.		
Power Plants 1 Lab.	20206222	1 (0-3)
Experiments on steam power plant: parts and components, operation, water treatment unit, Rankine cycle efficiency.		
Power Plants 2	20206223	3 (3-0)
Gas turbine power plants, combined cycle, diesel power stations, hydro-electric power stations, operation and maintenance of gas turbine based power plants, environmental impacts of power generation.		
Power Plants 2 Lab.	20206224	2 (0-6)
Experiments on gas turbine and diesel engine power stations: parts, operation and efficiency.		
Auxiliary Systems for Power Plants	20206231	3 (3-0)
Feed water treatment, cooling system, fuel systems, oil and lubrication systems, fans, blowers, pumps, fire fighting systems, chimney and air pollution control equipment.		

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Auxiliary Systems for Power Plants Lab.	20206232	1 (0-3)
Experiments related to Waste water treatment, cooling system, oil and lubrication systems, fans, blowers, pumps, fire fighting systems, chimney and air pollution control equipment.		
Training	20206291	3 (280 training hours)
Equivalent to (280 hours) of field training targeted to emphasize the ability of students to apply the theories in the real world of the profession.		
Project	20206292	3
An integrated assembly/design practical work related to the major fields of study.		





Engineering Program

Specialization	Common
Course Number	20301111
Course Title	Electricity and Electronics
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

Concepts and definitions, electrical circuit elements, voltage, current, resistance, capacitance and inductance, ohms law and dc circuit Calculations. Ac Circuits. Three phase circuits, transformers, and electrical machines. Basic electronic devices and circuits. Introduction to electrical protection.

Course Objectives:

1. Defined and study current and voltage sources.
2. Use different theorems for analyzing DC electrical circuit.
3. Study the elements of AC circuit.
4. Study the resonance in AC parallel and series circuit.
5. To familiarize student with classification of electrical machines.
6. To know the structure, principle of operation, characteristic and equations related (Transformers, DC machines, AC machines).



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Direct Current Circuits	<ul style="list-style-type: none"> Circuits and circuit elements. Open loop, closed loop and short circuits. Current, voltage, power. Basic calculations. Series and parallel connections of resistors. 	5
2.	Alternating Current Circuits	<ul style="list-style-type: none"> Sine wave voltage. Main characteristics of sine waves. Single-phase and three-phase circuits. Basic calculations. Power factor. 	4
3.	Transformers	<ul style="list-style-type: none"> Basic construction and principle operation of single-phase transformer. Basic relationships between primary and secondary windings. 	2
4.	Electrical machines	<ul style="list-style-type: none"> DC motors and generators. Principle of operation. Construction. Main characteristics. Induction motors: single-phase and three-phase. Construction and basic principle of operation. Main characteristics. 	4
5.	Semiconductor devices	<ul style="list-style-type: none"> Diodes and transistors. Main characteristics, symbols. Basic applications. 	4
6.	Control and protection devices	<ul style="list-style-type: none"> Switches, relays, circuit breakers, electromagnetic, thermal and bi-metallic contactors. Ratings, applications, symbols, basic principle of operation. 	4

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Assignments	10%	--/--/----
	Final Exam	50%	--/--/----

Teaching Methodology:

- ❖ Lecture and presentations

Text Books & References:**Textbook:**

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20301112
Course Title	Electrical Engineering Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

DC and AC circuits. Current and voltage measurements. Simple electronic circuits. DC and AC machines. Single-phase transformers. Protection devices and circuits.

Course Objectives:

1. To use measuring devices
2. To distinguish different types of electrical machines
3. To distinguish different types of control elements and protection devices
4. To practice electrical wiring



Detailed Course Description:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Series and parallel DC circuits	<ul style="list-style-type: none"> Current and voltage measurements. Voltage and current dividers 	
2.	Power measurements in DC circuits	<ul style="list-style-type: none"> To check “the of conservation of energy” 	
3.	AC circuits	<ul style="list-style-type: none"> Use oscilloscope and measuring devices to determine and measure the main features of sine waves 	
4.	Transformer	<ul style="list-style-type: none"> Study the relationships between primary and secondary windings 	
5.	DC machines	<ul style="list-style-type: none"> Characteristics of DC motors and generators 	
6.	Three-phase induction motor	<ul style="list-style-type: none"> Study the characteristics of three-phase induction motors 	
7.	Electronic devices	<ul style="list-style-type: none"> Investigate the characteristics of diodes and transistors. Build simple rectification circuits 	
8.	Control and protection devices	<ul style="list-style-type: none"> Construct and test simple circuits to demonstrate the operation of control and protection devices 	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Med term	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

- Laboratory

Text Books & References:

Instructional Lab. Sheets

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207111
Course Title	Fluids and Hydraulic Machines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Fluid properties, fluid static's, fluid motion, continuity equation, momentum principle, energy principle, Fluid flow in pipes, pipe friction, introduction to Pumps, Types ,Selection and application of pumps.

Course Objectives:

1. Develop competence in use of conservation laws (mass, energy, momentum) for analysis, design, selection, and operation of flow measuring devices, of open and closed water and waste water conveyance systems, and of hydraulic machines (pumps, turbines).
2. Utilize methods for risk and reliability analysis along with engineering economics in selecting components and systems.
3. Strengthen understanding of phenomena (e.g., cavitation, pressure/flow relations, losses), devices, components and systems with laboratory experiments and field trips.
4. Improve communication skills through report writing.
5. Development of dimensionally consistent equations. Competence with both SI and British Gravitational system of units.
6. Development of mass, momentum, and energy balances.
7. Application of conservation equations for pipe flow, pumping, and simple open channel flow application.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Introduction ▪ Units of measurement ▪ Fluid physical properties, Density, specific weight, viscosity, surface tension, compressibility 	
2.	Hydrostatics	<ul style="list-style-type: none"> ▪ Fluid pressure, Pascal's law, Pressure variation in static fluid, pressure head, Gage and absolute pressure ▪ Pressure measurements (barometer, Manometers, Piezometer, Bourdon tube) ▪ Engineering applications of hydrostatics 	
3.	Equilibrium of Floating Bodies	<ul style="list-style-type: none"> ▪ Archimedes principle ▪ Metacenter and metacentric height ▪ Condition of Equilibrium ▪ Oscillation of floating body 	
4.	Fluid Flow Concept	<ul style="list-style-type: none"> ▪ Types of flow, Laminar and turbulent flow, uniform flow, steady and unsteady flow, incompressible and Compressible flow ▪ Fluid energy: internal energy, Kinetic energy, potential energy, pressure energy ▪ Fluid motion equations: Continuity, equation of motion for steady flow, Bernoulli equation and its applications ▪ Flow measurement: Flow through Orifice, venture, flow over notches, Pitot tube, Rota meter, discharge coefficients 	
5.	Flow through pipes	<ul style="list-style-type: none"> ▪ Types of flow in pipes, Reynolds number, boundary layer and flow in pipe, loss head in pipes Darcy-Wies formula of head in pipe, relation between friction coefficient and Reynolds ▪ Friction loss in sudden contraction and expansion ▪ Friction loss in fittings and valves ▪ Velocity distributions in pipe flow ▪ Positive displacement pumps ▪ Gear and screw pumps ▪ Centrifugal pumps 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none">▪ Pumps performance and characteristics curves▪ Power and efficiency calculations	
6.	Pumps	<ul style="list-style-type: none">▪ Types of Pumps, Principle of operation▪ Pump power and efficiency▪ Net positive section head▪ Reciprocating pumps: Construction, reducing flow fluctuations	
7.	Compressors	<ul style="list-style-type: none">▪ Types of Air compressors▪ Reciprocating compressors▪ Centrifugal compressors	

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homeworks and quizzes		10%	

Teaching Methodology:

1. Lectures
2. Power point presentations
3. Discussion

Text Books & References:

References:

1. Textbook of Hydraulics, Fluid Mechanics and Hydraulic Machines by R.S. Khurmi, Publisher: S Chand, New Delhi (May 1987), ISBN: 8121901626.
2. Franzini, Fluid Mechanics with Engineering Applications, 10th Edition, McGraw Hill, 2002.
3. Giles R V et al, "Schaum's Outline of Theory and Problems of Fluid Mechanics and Hydraulics", 3rd Edition, McGraw-Hill, 1994.
4. E John Finnemore and Joseph B Franzini, Fluid Mechanics With Engineering Applications, 10th Edition.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207112
Course Title	Fluids and Hydraulic machines Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Measuring of physical properties of fluids, force on immersed plate, Jet force on plate, Bernoullis equation, Reynolds experiments, flow through orifices, and nozzle venture friction factor.

Course Objectives:

At the completion of this course, each student is expected to be able to:

1. Validate Bernoulli's equation.
2. Measure the fluid Density and viscosity.
3. Determine the Force of pressure on immersed plate.
4. Study the Energy loss and friction coefficient.
5. Perform Flow rate measurements (by orifice and venture).
6. Study the performance of Reciprocating, gear, and centrifugal pumps.
7. Connect pumps in series and parallel and investigate the performance of each configuration.



Detailed Course Description:

Lab Number	Lab Name	Lab Content	Time Needed
1.	Density and viscosity measurements		1
2.	Force of pressure on immersed plate		1
3.	Demonstrating of Bernoulli's equation		1
4.	Flow rate measurements (flow through orifice and venture)		1
5.	Energy loss and friction coefficient measurements		1
6.	Head loss in smooth and rough pipes		1
7.	Pipe flow, Reynolds number, laminar and turbulent flow in pipes		1
8.	Flow over notches and Weirs		1
9.	Pump Testing in Series		1
10.	Reciprocating pump performance		1
11.	Gear pump efficiency		1
12.	Performance of Reciprocation air compressor		1
13.	Centrifugal Pump Testing		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----

Teaching Methodology:

2. Laboratory

Text Books & References:

Instructional Lab. Sheets



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207131
Course Title	Internal Combustion Engines
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Definition and introduction to the (ICE) fundamentals of engine, operation engine types and classification, engine construction, engine measurements and performance, engine system (lubrication, cooling, fuel) Including both carburetor and electronic fuel injection system.

Course Objectives:

After studying this course student of Autotronics should be able to Know :

1. Studying types of engines.
2. Studying and operating of internal combustion engine.
3. Studying fuel used and system of engine.
4. Studying fuel in Gasoline and diesel engine.
5. The student should know about turbo charging and super charge and intercooler.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to internal combustion engines	<ul style="list-style-type: none"> ▪ Types of (ICE) ▪ System of (ICE) ▪ Important of (ICE) in different fields ▪ Differences between (ICE) and other engine types like steam engine, electrical vehicles 	
2.	Classification of (ICE) according to	<ul style="list-style-type: none"> ▪ Number and arrangement of cylinders ▪ Valve arrangement in cylinder head ▪ Type of cooling systems ▪ Type of fuel 	
3.	Engine operation	<ul style="list-style-type: none"> ▪ Four stroke operation for Gasoline and diesel engine ▪ Engine diagram between pressure and crankshaft angles for four stroke engine (Gasoline and diesel) ▪ Engine pressure volume diagram with the relation of rpm and piston displacement for Gasoline engine ▪ Engine pressure – volume diagram for all Gasoline engine 	
4.	Piston , cylinder construction	<ul style="list-style-type: none"> ▪ Engine cylinder block types and operation ▪ Piston types and operation ▪ Piston rings types and operation ▪ Cylinder head types and operation ▪ Combustion chamber types ▪ Connecting rods, types and operation ▪ Crankshaft types and operation ▪ Vibration dampers ▪ Intake and exhaust manifolds 	
5.	Valves and valves Trains	<ul style="list-style-type: none"> ▪ Cam and cam shaft and operation ▪ Mechanical and Hydraulic valves, construction parts and cooling ▪ Springs and oil seals for valves ▪ Valve seats and types ▪ Valve lifters and types ▪ Rocker Arms ▪ Valve timing and types ▪ Engine timing gears and types 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none"> ▪ Valve operation and engine timing operation 	
6.	Engine – performance measurements	<ul style="list-style-type: none"> ▪ Bore and stroke ▪ Piston displacement ▪ Top and bottom Dead centers ▪ Compression ratio (CR) and effects and increasing CR on engine operation ▪ Mean effective pressure ▪ Engine friction and indicated power out put ▪ Volumetric friction and indicated efficiency ▪ Power out put calculation ▪ Engine torque and relation with power out put and engines speed and diagrams ▪ Delivery of air-fuel mixture 	
7.	Automotive engine fuels	<ul style="list-style-type: none"> ▪ Gasoline , sources ,types and volatility ▪ Antiknock value in gasoline engine and facts effect knocking ▪ Octane No. rating, measuring, antiknock value during combustion and chemical control effectuating ▪ Types of abnormal combustion and normal combustion ▪ Diesel fuel, types, classification, volatility, and viscosity ▪ Cetane NO. and conditions effects its value ▪ Diesel fuel additives ▪ Diesel fuel combustion and conditions effect on it ▪ Detonation of diesel fuel and factors effect on it 	
8.	Gasoline engine fuel and Exhaust system	<ul style="list-style-type: none"> ▪ Purpose of fuel system ▪ Components of gasoline fuel system and operation (Tank, fuel pump, lines, carburetors , indicators and others) ▪ Components of Gasoline carburetor operation and types ▪ Carburetor cycles and systems ▪ Mechanical and electrical fuel pumps ▪ Conditions effect cerebration Fuel filters ▪ Crank case ventilation, and exhaust gas recalculation 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

		<ul style="list-style-type: none"> ▪ Exhaust system, muffler and exhaust pipes ▪ Exhaust gases treatment and its effect on environment 	
9.	Diesel fuel – injection systems	<ul style="list-style-type: none"> ▪ Diesel fuel – injection systems requirements ▪ Types of fuel – injection systems ▪ Cam operated 1-line plunger pump, components and operation ▪ Rotary distributor pump, components and operation ▪ Governors, types (centrifugal weights, vacuum) ▪ Automatic advance system of injection ▪ Diesel fuel injection and different factors effected by ▪ Fuel injectors- types and classifications, components and operation ▪ Diesel engine combustion chambers, types and its effect on combustion 	
10.	Engine cooling system	<ul style="list-style-type: none"> ▪ Purpose of the cooling system ▪ Types of the cooling systems (water, air) ▪ Components of water cooling system, function of each part, and explain cooling circulation in the system ▪ Operation of air cooling system ▪ Radiators types and materials ▪ Antifreeze solution ▪ Temperature indicators 	
11.	Engine lubricating systems	<ul style="list-style-type: none"> ▪ Purpose of the lubricating system ▪ Types of lubricating systems ▪ Components of lubricating system, operation of each part ▪ Oil filters, types and purpose ▪ Oil indicators 	
12.	Wangle (rotary) engines , and turbo charge engines , and increase power engine systems	<ul style="list-style-type: none"> ▪ Wangle (rotary) engines, components and operation ▪ Turbo – charges components and operation ▪ Super charge components and operation ▪ Inter cooler components and operation 	

Evaluation Strategies:

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

Teaching Methodology:

- ❖ Lectures and presentations

Text Books & References:

Textbook:

1. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
2. John Remling, Automotive Electricity , John Wikly & sons,Inc., U.S.A. 1987.
3. William H. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20207132
Course Title	Internal composition Engines lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Performance tests for spark and compression engines, air and fuel consumption, air fuel ratio, brake and indicated horse power, specific fuel consumption, volumetric efficiency, energy balance, variable compression ratio, engine emission, diagnostic, adjustment of engine.

Course Objectives:

After practical this course you should be able to :

1. Studying and calculate engine measurement and performance.
2. Studying and calculate engine efficiency torque and horse power.
3. Studying and training compression, firing order, timing advance. Timing valves, wheel balance.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Detailed Course Description:

lab Number	lab Name	lab Content	Time Needed
1.	Introduction to internal combustion engine		1
2.	Specific fuel consumption		1
3.	Specific air consumption		1
4.	Richness of mixture and excesses air		1
5.	Volumetric efficiency Heat balance		1
6.	Heat loss in cooling water		1
7.	Heat loss at engine exhaust		1
8.	Heat loss by radiation		1
9.	Engine torque, brake power, and Mechanical efficiency		1
10.	Compression pressure		1
11.	Cylinder leakage		1
12.	Timing advance test, firing order		1
13.	Timing valves adjustment and		1



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	
	Discussion of Sheets	30%	
	Final Exam	50%	

Teaching Methodology:

Laboratory

Text Books & References:

References:

1. Introduction to Internal Combustion Engines, by Richard Stone, 3rd Edition, 1999, SAE International
2. Jack ERJAVEC, AUTOMOTIVE Technology A system Approach, Delmar. U.S.A – 2005.
3. John Remling , Automotive Electricity , John Willy & sons, Inc., U.S.A. 1987 .
4. William H. Crouce and Donald Anglin, Automotive Mechanics, Hill school publishing company, USA, 1993.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Engineering Program

Specialization	Common
Course Number	20204211
Course Title	Mechanical Drawing
Credit Hours	2
Theoretical Hours	0
Practical Hours	6



Brief Course Description:

- ❖ The course is designed to develop the technical sense for the student and enable him to create and analyze the different mechanical parts, pipes and ducts ,mechanical and HVAC symbols . Assembly and detailed drawings for technical arrangements. Applications for CAD and Solid Works modelling.

Course Objectives:

This course aims at:

1. Create engineering drawings involving isometric projection and constructing sections.
2. Create technical drawings for the commonly used parts in technical arrangements.
3. Represent the dimensions and data on technical drawings.
4. Create assembly drawings for technical arrangements.
5. Create detail drawings for technical arrangements.
6. Analyze technical drawings and make suggestions regarding them

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PART II – 3D Design (Solid Works)

1. User Interface:

1. Part
2. Assembly
3. Drawing
4. Tool Bars
5. Design Library
6. Materials
7. lights
8. Drawing Planes
9. Exercises

2. Sketch

1. Line
2. Rectangle
3. Parallelogram
4. Polygon
5. Circle, Perimeter Circle
6. Ellipse, Partial Ellipse
7. Arc (Centerpoint Arc, Tangent Arc, 3 Point Arc)
8. Parabola
9. Centreline



10. Point
- 11 . Exercises

2. Modifying Objects

1. Fillet
2. Chamfer (Distances, Distance and Angle)
3. Offset (Add dimensions, Reverse, Select chain, Bi-directional)
4. Trim (Trim to Closest, Trim away outside, Trim away inside, Corner)
5. Extend
6. Mirror
7. Move
8. Rotate
9. Scale
10. Linear and Circular Sketches
11. SpLine (Add Curvature Control, Insert Spline Point, Simplify Spline, Fit Spline, Show Spline Handles, Show Inflection Points, Show Minimum Radius, Show Curvature Combs.
12. Exercises

3. Dimensions

- Smart Dimensions
- Dimensions/Relations
 1. Vertical and horizontal dimensions, continuous dimensions
 2. Angles Dimensions
 3. Circles and arcs dimensions
 4. Auto Dimensions
 5. Full defined objects
 6. Relations between dimensions
 7. Add Relations
 8. Delete Relations
 9. Exercises

4. Quick Snap

1. point Snap
2. Center Point Snap
3. Nearest Snap
4. Midpoint Snap
5. Quadrant Snap
6. Intersection Snap
7. Tangent Snap
8. Exercises



5. 3D Sketch

6. Solid Part

1. Extrude

- Extrude-Boss/Base
- Extrude-Cut
- Edit Feature
- Reference Geometry-Planes:-
 1. Through Lines/Points
 2. Parallel Plane at Point
 3. Plane passing through line at Angle
 4. Plane with offset distance
 5. Plane Normal to Curve
 6. Plane tangent to cylindrical. Conical and Undefined Surfaces.
 7. Reference Axes
 8. Reference Point
- Extrude part of sketch
- Extrude opening sketch
- Extrude Path
- Revolve, Boss/Base revolve, revolve cut
- Sweep, Boss/Base sweep, sweep along path, sweep along path with normal Constant, sweep cut
- Twist, twist along path, twist along path with normal constant
- Loft, Boss/Base Loft, loft following leaders paths, loft cut, loft features.

7. Editing 3D Object

- Fillet/Round, constant radius, variable radius, full round fillet
- Chamfer, Angle distance ,distance distance, chamfer vertex

8. Ribs, insert rib, stress analysis

9. Shells, equal thickness setting and multi thickness settings

10.3D Curves, projected curve, Composite curve, Helix and Spiral, Curve through Reference Points, Split line.

11. Draft, natural plane, parting line, step draft

12. Pattern, Linear pattern ,circular pattern, curve drive pattern, sketch driven Pattern, coordinate system.

13. Mirror and Scale

14. Body Flex. Bending, Twisting, Tapering. Stretching, Dome.

15. Deform, deform using point, deform using path, shape deform.

16. Warp and combine.

17. Simple Holes and Holes Wizard.

18. Surfaces Creating, Extruded Surfaces, Revolve Surfaces, Swept Surfaces, Lofted Surfaces, offset Surfaces, Filled Surfaces, Ruled Surfaces, Planner Surfaces, Trim Surfaces, Knit Surfaces, Thicken Surfaces, Replace Surfaces

19. Assembly
20. Work Shop Drawing

Grading:

Lab works	30%
Midterm exam	20%
Final exam	50%

Textbooks:

1. Introduction to AutoCAD 2008 2D AND 3D.ALF YARWOOD
2. Solid Works for Designers Release 2007, CADCIM Technologies, USA.





Engineering Program

Specialty	Common
Course Number	20207121
Course Title	Mechanics
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

General principles, Force vector, Equilibrium of a particle, Force system resultant Equilibrium of rigid body, Analysis of structures, Internal forces, Dry friction, Centroid and Moment of Inertia, Kinematics of a particle, Kinetics of a particle(Forces and acceleration), Kinetics of a particle (impulse and momentum).

Detailed Course Description:

Unit	subject
1	General principles: Mechanics, Fundamental concept, Units, SI System.
2	Force vector: Scalars and Vectors, Vector operations, Vector addition of forces, Cartesian vectors, position vector, Force vector directed along a line, Dot product. .
3	Equilibrium of a particle: Equilibrium condition, Free body diagram, Coplanar force system.
4	Force system resultant: Cross product, Moment of a force, Principle of moment, Moment of a force about a specified axis, Couple, Reduction of a simple distributed load.
5	Equilibrium of rigid body: Conditions of rigid body Equilibrium, Equilibrium in two dimensions.
6	Analysis of structures: Simple trusses, The method of joints, Zero force members, The method of section, frame.
7	Internal forces: Internal forces in structural members.
8	Dry friction: Characteristics of dry friction, Rules of dry friction, Angle of friction, Problems involving dry friction.
9	Centroid and Moment of Inertia: Centroid and Moment of Inertia for particle and body, composite bodies, parallel – axis theorem for an area, Moment of Inertia for mass.
10	Kinematics of a particle : continuous motion, graphical solution, general curvilinear motion(rectangular components),motion of a projectile
11	Kinetics of a particle (Forces and acceleration): equation of motion, equation of motion for a system of particles (rectangular components).
12	Kinetics of a particle (impulse and momentum): principle of linear impulse and momentum, principle of linear impulse and momentum for a system of particles, impact.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homeworks and quizzes		10%	

Text Book:

- Engineering Mechanics- Statics & Dynamics ,By Hibbeler, 10th edition.

References:

- Vector Mechanics for Engineering - Statics & Dynamics ,By Beer and Johnston, 6th edition, McGraw Hall.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program Engineering

Specialization	Power Plants
Course Number	20206221
Course Title	Power Plants 1
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Classification of power plants, steam power plants, Rankine cycle, reheat and regeneration, condensers, pumps and piping networks, types of steam turbines, water desalination and treatment units, operation and maintenance of steam power plants.

Course Objectives:

To provide students with basic understanding of main parts and operation of conventional steam power plants. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology and diagrams.
3. Work with other students to determine main operational parameters of steam turbines based power plants.
4. Grasp concepts and basics of operation and maintenance of steam power plants.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Classification of power plants	<ul style="list-style-type: none"> Introduction and principles, types of power plants, power generation in Jordan 	
2.	Steam power plants	<ul style="list-style-type: none"> Saturated and superheated steam, ideal Rankine cycle, regeneration cycle and feed water heaters, reheat cycle, deviation of actual cycle, thermal efficiency of actual Rankine cycle 	
3.	Condensers	<ul style="list-style-type: none"> Principals and types of condensers , heat and mass balances, operation and maintenance procedures 	
4.	Pumps and piping	<ul style="list-style-type: none"> Types of pumps, connections, types and selection of pipes, thermal insulation 	
5.	Steam turbines	<ul style="list-style-type: none"> Types of steam turbines, construction and velocity-pressure diagrams, efficiency, general maintenance guidelines 	
6.	Water desalination and treatment units	<ul style="list-style-type: none"> Introduction, general classification, advantages and disadvantages of different types, sea water desalination, thermal and reverse osmosis systems, impurities in water, water standards, waster water treatment units, general operation and maintenance guidelines 	



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	

Teaching Methodology:

1. Lecture
2. Power Point Presentation
3. Discussion

Text Books & References:

Textbook:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.

References:

1. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
2. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
3. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.





Program Engineering

Specialization	Power Plants
Course Number	20206222
Course Title	Power Plants 1 Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

- ❖ Experiments on steam power plant: parts and components, operation, water treatment unit, Rankine cycle efficiency.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

2. Understands different subjects and content of the study plan.
3. To be familiar with used terminology.
4. Work with other students to determine main operational parameters of steam power plants.
5. Establish heat and mass balances of various components.



Detailed Course Description:

Lab Number	Lab name	Lab content	Time Needed
1.	Main components of steam power plants		
2.	Water treatment units: classification, maintenance and operation		
3.	Operation and shut down of steam power plants		
4.	Steam boiler's efficiency		
5.	Rankine cycle efficiency: effects of pressure and temperature		
6.	Steam turbine efficiency: input, output, speed and torque, mechanical efficiency		
7.	Generator efficiency, input, output, efficiency		
8.	Condenser thermal balance		



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	Med-term Exam	20%	--/------
	Reports	30%	--/------
	Final Exam	50%	--/------

Teaching Methodology:

- ❖ Laboratory

Text Books & References:

References:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.
2. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
3. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
4. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program Engineering

Specialization	Power Plants
Course Number	20206223
Course Title	Power Plants 2
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



Brief Course Description:

- ❖ Gas turbine power plants, combined cycle, diesel power stations, hydro-electric power stations, operation and maintenance of gas turbine based power plants, environmental impacts of power generation.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology and diagrams.
3. Work with other students to determine main operational parameters of gas turbines and diesel power plants.
4. Get familiar with new and modern energy systems (wind, solar, etc.).



Detailed Course Description:

Unit Number	Unit name	Unit content	Time Needed
1.	Gas turbines	<ul style="list-style-type: none"> Introduction and principles, Bryton cycle, performance and efficiency 	
2.	Efficiency improvement of gas turbines	<ul style="list-style-type: none"> Regenerative cycle, reheat cycle, inter-cooled compression 	
3.	Gas turbine operation and accessories	<ul style="list-style-type: none"> Starters, standard procedures of operating and shutting down gas turbine plant, intake filters, exhaust, lubrication, fire-fighting and control systems 	
4.	Combined cycle	<ul style="list-style-type: none"> Main components, waste heat recovery steam generator, thermal efficiency and performance 	
5.	Diesel power stations	<ul style="list-style-type: none"> Introduction and classification of internal combustion engines, main components, accessories, intake and fuel systems, lubrication, exhaust, cooling system, electrical equipment, operational and maintenances guidelines 	
6.	Renewable energy systems	<ul style="list-style-type: none"> Types and advantages, wind turbines, solar thermal power systems, photo-voltaic and fuel cells, hydro-electric plants 	
7.	Environmental impacts of power generation	<ul style="list-style-type: none"> Air pollution, liquid and solid waste, greenhouse gases and climate change, thermal pollution, air pollution control technologies 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and Projects		10%	

Teaching Methodology:

1. Lecture
2. Power Point Presentation
3. Discussion

Text Books & References:

Textbook:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.

References:

1. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
2. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
3. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program Engineering

Specialization	Power Plants
Course Number	20206224
Course Title	Power Plants 2 Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Experiments on gas turbine and diesel engine power stations: parts, operation and efficiency.

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology.
3. Work with other students to determine main operational parameters of gas turbines and diesel power plants.
4. Establish heat and mass balances of various components.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Detailed Course Description:

Lab Number	Lab name	Lab content	Time Needed
1.	Main components of a gas turbine power plant		
2.	Operation and shutdown of a gas turbine power plants		
3.	Gas turbine performance		
4.	Main components of a diesel engine power plants		
5.	Operation and shut down of a diesel engine power plants		
6.	Diesel engine performance		
7.	Thermal efficiency, heat rate and specific fuel consumption		
8.	Air/fuel ratio		
9.	Exhaust gas analysis		



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	Med-term Exam	20%	--/------
	Reports	30%	--/------
	Final Exam	50%	--/------
Homework and Projects			

Teaching Methodology:

- ❖ Laboratory

Text Books & References:

References:

1. Power Plant Technology, by M.M. El-Wakil, McGraw Hill, New York, USA.
2. Power Plant Engineering, G.R. Nagpal, Khanna Publishers, Delhi, India.
3. Advanced Energy Systems, N.V. Khartchenko, Taylor & Francis, Washington, DC, USA.
4. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Program Engineering

Specialization	Power Plants
Course Number	20206211
Course Title	Steam Generation
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ To provide students with basic understanding of main parts and operation of steam boilers for different applications. Upon completion of this course the student should achieve the following goals:

Course Objectives:

To provide students with basic understanding of main parts and operation of steam power stations. Upon completion of this course the student should achieve the following goals:

1. Understands different subjects and content of the study plan.
2. To be familiar with used terminology and diagrams.
3. Work with other students to determine main operational parameters of steam boilers.
4. Establish heat and mass balances of various components of the boiler.



Detailed Course Description:

Unit Number	Unit name	Unit content	Time Needed
1.	Properties of a pure substance	<ul style="list-style-type: none"> Pure substance, vapor-liquid-solid phase, thermodynamic properties 	
2.	Boilers	<ul style="list-style-type: none"> Types of boilers, pros and cons of different types and designs 	
3.	Main components and accessories	<ul style="list-style-type: none"> Feed water heaters, economizers, evaporators, superheaters, air preheater, steam separators, feed water pump, fans, blow-down system, soot blowers, and control 	
4.	Fuels and combustion	<ul style="list-style-type: none"> Types of fuels, combustion process, combustion systems (gas, liquid and solid fuels) 	
5.	Boiler performance	<ul style="list-style-type: none"> Losses in boiler, efficiency, capacity 	
6.	Operation and maintenance	<ul style="list-style-type: none"> Standard procedures of boiler operation, general maintenance, main problems and corrective actions, safety and occupational health 	



Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	--/------
	Second Exam	20%	--/------
	Final Exam	50%	--/------
Homework and Projects		10%	

Teaching Methodology:

1. Lecture
2. Power Point Presentation
3. Discussion

Text Books & References:

Textbook:

1. Industrial Boilers, by David Gunn and Robert Hobert, Longman, New York, USA.

References:

1. Principles of Energy Conversion, by Archie W. Culp, 2nd edition, McGraw-Hill, Inc., New York, USA.
2. Power Station Engineering and Economy, B.C. Strotki and W.A. Vopat, McGraw-hill, 1988.
3. Steam Plant Operation, E.B. Woodruff, H.B. Lammers and T.F. Lammers, McGraw-hill, 1992.



Engineering Program

Specialization	Power Plants
Course Number	20206212
Course Title	Steam Generation Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Brief Course Description:

Experiments on steam generator parts and components, operation, water treatment unit, boiler efficiency.

Course Objectives:

Upon the completion of this course, the student will be able to:

1. Understand the operation and main parts of steam generator
2. Establish heat and mass balances of various components



Detailed Course Outline:

Unit Number	Lab. Name	Unit Content	Time Needed
1.	Components and operation of steam generator		
2.	Components and operation of water treatment units		
3.	Regeneration of water from treatment unit		
4.	Saturation Temperature of steam		
5.	Boiler Efficiency		
6.	Fuel Combustion		
7.	Losses in boiler		
8.	Boiler maintenance		

Evaluation Strategies:

Exams		Percentage	Date
Exams	Midterm Exam	20%	
	Reports	30%	
	Final Exam	50%	

Teaching Methodology:

- ❖ Laboratory

Text Book

1. Instructional Lab. Sheets



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201231
Course Title	Theory of machines
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Introduction, linkages and mechanisms, cams, spur gears, nonstandard spur gears, bevel, helical and worm gears, gear trains, velocity and acceleration analysis, force analysis of machinery, Blanca of machinery introduction to synthesis, governors, special mechanisms and robotics

Course Objectives:

Analyze the velocity and acceleration of the points in the different type of linkages

1. Distinguish between the static and dynamic balance of the machines.
2. Classify gears type and their notations.
3. Distinguish between the different linkages to transmit motion and power.
4. Analyze the force effecting on the governors.



Detailed Course Description:

Unit Number	Unit Name	Unit Content	Time Needed
1.	Introduction to study mechanisms	<ul style="list-style-type: none"> ▪ Mechanisms machine ▪ Motion ▪ Cycle period and phase of motion ▪ Pairing elements ▪ Link. chain 	
2.	Linkages and mechanisms	<ul style="list-style-type: none"> ▪ Four bar linkage ▪ Slider crank mechanisms ▪ Scotch yoke ▪ Quick return acceleration ▪ Hooks coupling 	
3.	Velocity and acceleration	<ul style="list-style-type: none"> ▪ Linear and angular motion of particle ▪ Relative motion ▪ Graphical determination of velocity in mechanisms ▪ Instantaneous center of velocity ▪ Graphical determination of acceleration in mechanisms ▪ Relative acceleration of coincident particles on separate links carioles component of acceleration 	
4.	Cams	<ul style="list-style-type: none"> ▪ Disc cam with radial follower ▪ Disc cam with oscillating follower ▪ Cylinder cam ▪ Disc cam with redial roller follower 	
5.	Gear	<ul style="list-style-type: none"> ▪ Introduction to involate spur gear ▪ Spur gear detail ▪ Characterization of involate action ▪ Nonstandard spur gears ▪ Gear train ▪ Introduction to gear trains ▪ Planetary gear trains ▪ Applications of planetary trains 	
6.	Belts	<ul style="list-style-type: none"> ▪ Flat belt ▪ V- belt 	
7.	Balance of machinery and governors	<ul style="list-style-type: none"> ▪ Introduction ▪ Balance of rotors ▪ Dynamic and static balance ▪ Balancing machines ▪ Governors, types of governors 	

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Assignments	10%	
	Final Exam	50%	

Teaching Methodology:

1. Lecture
2. Power point presentation
3. Discussion

Text Books & References:

References:

1. Mechanisms and dynamics of machinery By Hamilton H. and Fred W. Ocvirk.
2. Theory of machines by R. S. Khurmi and J. K. GUPTA.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20201232
Course Title	Theory of machines lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ This course give the student an opportunity to apply the theory gained within the theory of machines theoretical course through practical experimentation. Balancing motion transmission through mechanisms .speed changing and.

Course Objectives:

1. Classify types of motion.
2. Classify the linkages types.
3. Classify the gears types and their function.
4. Create balance testing for the rotating bodies.



Detailed Course Description:

lab Number	lab Name	lab Content	Time Needed
1.	Slider crank mechanisms (velocity and acceleration)		1
2.	Scotch yoke mechanisms (velocity and acceleration)		1
3.	Mass balance of rotating masses Gear box arrangement		1
4.	Friction in the belt		1

Evaluation Strategies:

Exams		Percentage	Date
Exams	Mid Exam	20%	
	Discussion of Sheets	30%	
	Final Exam	50%	

Teaching Methodology:

- Laboratory

Text Books & References:**References:**

- Theory of machines by R.S Khurmi and J. K. Gupta.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20209111
Course Title	Thermal Engineering
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

Concepts and definitions, Properties of a pure substance, Work and heat, the first law of thermodynamics, the second law of thermodynamics, Principles of heat transfer
Steady state conduction, Radiation, Heat exchangers

Detailed Course Description:

Unit	subject
1	Concepts and definitions: System, control volume, properties, state of substance, processes, cycles, specific volume, pressure, temperature scales, zeroth law of thermodynamics, units
2	Properties of a pure substance: vapor-liquid-solid phase equilibrium in a pure substance, equation of state, tables of thermodynamic properties.
3	Work and heat: definition and unites of work, work done at the moving boundary of a simple compressible system, definition and unites of heat, relation between work and heat.
4	The first law of thermodynamics: The first law for the change in state of a system ,internal energy, enthalpy, constant volume and pressure specific heats, internal energy and enthalpy and constant volume and pressure specific heats for ideal gases, the first law of thermodynamics for a control volume, the steady state, steady flow process.
5	The second law of thermodynamics: the engines and refrigerators, reversible process, cornot cycle, entropy ,entropy change of an ideal gas, ploytropic and adiabatic reversible process.
6	Principles of heat transfer: conduction heat transfer, plane wall, plane wall in series and parallel, electro analog for conduction, contact resistance, thermal conductivity, convection heat transfer, radiation heat transfer, combined heat transfer mechanisms.
7	Steady state conduction: steady one –dimensional conduction equation without generation in rectangular coordinates, cylindrical coordinates, steady one –dimensional conduction equation with generation, fins, types of fins, fin efficiency, transient conduction with negligible internal resistance.
8	Radiation: physics of radiation, black body, planks law, stefan-Boltzman law, radiation properties, kirchoff's law, gray body, shape factor, radiative exchange between black surfaces.
9	Heat exchangers: types, overall heat transfer coefficient, the log-mean temperature difference, heat exchanger effectiveness.

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Evaluation Strategies:

Exams		Percentage	Date
Exams	First Exam	20%	
	Second Exam	20%	
	Final Exam	50%	
Homework and quizzes		10%	

Text Books :

- Fundamentals of Thermodynamics, 6th Edition Richard E. Sonntag, Claus Borgnakke and Gordon J. Van Wylen John Wiley and Sons Inc., New York, NY, 2003
- Basic heat transfer, Frank kreith and william Z.Black, Harper&row.

□ **References:**

1. Y.A. Cengel, Introduction to Thermodynamics and Heat Transfer, Irwin/McGraw- Hill, 1997.
2. Fundamentals of Engineering Thermodynamics, M. J. Moran, H. N. Shapiro 5th Ed, John Wiley & Sons, Inc., 2004, ISBN: 0-471-27471-2.
3. J.B. Jones and G.A. Hawkins, Engineering Thermodynamics, Second Edition, John Wiley & Sons, 1986
- 4.

اساسيات الديناميكا الحرارية الكلاسيكية، وايلي وسونتاغ، ترجمة مركز الكتب الاردني، الطبعة الثانية.



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008



Engineering Program

Specialization	Common
Course Number	20209112
Course Title	Thermal Engineering Lab
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008

Brief Course Description:

- ❖ Pressure – Temperature relation in the saturation region; Compressor cycles and analyses; Heat pump performance; Conduction heat transfer; Radiation heat transfer; and Heat exchanger performance

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Saturation Pressure- Saturation Temperature relation (Marcel Boiler)	
2.	Heat losses in Heat pump condenser	
3.	Energy balance of Heat pump	
4.	Coefficient of performance of heat pump	
5.	Air compressor polytropic work	
6.	Isothermal efficiency of reciprocating air compressor	
7.	Volumetric efficiency of reciprocating air compressor	
8.	longitudinal Condition in simple bar	
9.	radial Condition in simple bar	
10.	Conduction in composite bar	
11.	Effect of insulation on conduction heat transfer	
12.	Forced convection heat transfer	
13.	performance of parallel and counter flow heat exchangers	
14.	performance of cross flow heat exchangers	

Evaluation Strategies:

Exams		Percentage	Date
Exams	Midterm Exam	20%	--/--/----
	Reports	30%	--/--/----
	Final Practical Exam	50%	--/--/----
Homework and Projects		10%	

Text Books & References:**Instructional Lab. Sheets**

❖ تطبق هذه الخطة الدراسية اعتباراً من بداية العام الجامعي 2009/2008