



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Heating Systems Design
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



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

Brief Course Description:

Introduction, Insulation, Heating Load Calculations, Fuel used for Heating Systems, Components Of Hot Water System, Hot Water Heating System, Under-floor System, Vapor Heating System, Hot Air Heating System.

Detailed Course Description:

Unit Number	Unite name	Unite content	Time Needed
1.	Introduction	<ul style="list-style-type: none"> ▪ Heat Transfer Methods ▪ Heating Methods ▪ Central Heating Systems ▪ General Components of Heating Systems ▪ Thermal Units 	
2.	Insulation	<ul style="list-style-type: none"> ▪ Thermal Insulation, Definition ▪ General Properties, Forms, Thickness of thermal materials ▪ Humidity, Definition, Sources, Insulation, Properties , Types, Methods ▪ Insulation Position 	
3.	Heating Load Calculations	<ul style="list-style-type: none"> ▪ Definitions ▪ Heating Load ▪ System Capacity ▪ Design Conditions ▪ Heating Load Sources ▪ Walls ▪ Ceilings ▪ Floors ▪ Doors ▪ Windows ▪ Air Change, Air Leakage, Filtration 	
4.	Fuel used for Heating Systems	<ul style="list-style-type: none"> ▪ Fuel Heating Value ▪ Properties of Fuel ▪ Solid Fuel ▪ Gaseous Fuel ▪ Liquid Fuel, Diesel ▪ Fuel Tank Volume Calculation and Storage Safety 	
5.	Components Of Hot Water System	<ul style="list-style-type: none"> ▪ Boiler: Function, Types and Classification, Capacity, Efficiency, Selection ▪ Liquid Fuel Burner: Function, Types (Evaporating, Spry, Selection) ▪ Pipes: Function, Types, Materials ▪ Function: -Expansion and Feeding Tank, Types, Volume 	

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

		<ul style="list-style-type: none"> ▪ Circulation Pump: Function, Type, Selection ▪ Radiators: Function, Types, Selection ▪ Water Cylinder: Function, size calculation and selection ▪ Chimney: Function, material, size calculation (diameter and height) ▪ Valves: Types, Selection 	
6.	Hot Water Heating System	<ul style="list-style-type: none"> ▪ Hot Water System: Advantages and Disadvantages, Classification ▪ Boiler Capacity calculation ▪ Flow Rates ▪ Pipes Size ▪ Floor Heating System 	
7.	Under-floor System	<ul style="list-style-type: none"> ▪ Method of Pipes Installations ▪ Pipes Loops Configuration ▪ Under-floor Heating Design Parameters ▪ Heat Transfer Calculations ▪ Water Flow Rate Calculation ▪ ASHRAE Method ▪ Pressure Drop calculation and Pump Selection ▪ Design Procedure ▪ Location of the Manifolds 	
8.	Vapor Heating System	<ul style="list-style-type: none"> ▪ Vapor Heating System: Advantages and Disadvantages, Classifications ▪ Pipes ▪ Pressure drop calculation ▪ System Components: Steam boiler, Steam traps ▪ Flow Rates ▪ Pipes Size ▪ Radiator ▪ Valves ▪ Pipes ▪ Gauges and Control Instruments 	
9.	Hot Air Heating System	<ul style="list-style-type: none"> ▪ Classifications ▪ Air Motion ▪ Ducts Shape ▪ Function of System Components; Furnaces, Ducts, Fan, Filter, Humidifier, Grills 	

Evaluation Strategies:

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

References:

1. Johnson ,Refrigeration and Air Conditioning Technology, 4th Edition, ISBN: 0766806677
2. Faye C. McQuiston, Jerald D. Parker, Jeffrey D. Spitler Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition, ISBN 0-471-47015-5.
3. W. P. Jones , Air Conditioning Engineering, 5th Edition, ISBN 0-750-65074-5
4. Bill Whitman, Bill Johnson, John Tomczyk, Refrigeration and Air Conditioning Technology, 5th Edition, ISBN 1-401-83765-4.
5. Faye C. McQuiston, Jerald D. Parker, Jeffrey D. Spitler Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition, John Wiley, ISBN: 0-471-47015-5, 2004.





Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Refrigeration Systems
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



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

Brief Course Description:

Introduction and Concepts, Simple Vapor Compression Cycle, Refrigerants, Cooling Load Estimation, Absorption Refrigeration System, Condensers, Evaporators, Compressors, Expansion Valves, Application of Refrigeration.

Detailed Course Description:

Unit Number	Unite name	Unite content	Time Needed
1.	Introduction and Concepts	<ul style="list-style-type: none"> ▪ Refrigeration Concepts ▪ Closed Refrigeration Circuit ▪ Open Refrigeration Circuit ▪ Refrigeration Methods, General Review 	
2.	Simple Vapor Compression Cycle	<ul style="list-style-type: none"> ▪ Reversible Carnot Cycle ▪ Vapor Refrigeration Machine ▪ Thermodynamic Calculation of the cycle 	
3.	Refrigerants	<ul style="list-style-type: none"> ▪ Classification and types ▪ Thermodynamic Specification ▪ Refrigerant Usage 	
4.	Absorption Refrigeration System	<ul style="list-style-type: none"> ▪ Introduction ▪ Simple Absorption ▪ Practical Vapor Absorption ▪ Advantages Of Vapor Absorption System Over Vapor Compression Systems ▪ Coefficient Of Performance ▪ Domestic Electrolux (Ammonia – Hydrogen, Lithium – Bromide) 	
5.	Cooling Load Estimation	<ul style="list-style-type: none"> ▪ Component Of Cooling Load ▪ Heating Gain Through Building Structure ▪ Heating Load Due To Infiltration & Ventilation ▪ Heating Gain Due To Occupants ▪ Heat Gain Due To Machines 	

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

		<ul style="list-style-type: none"> ▪ Heat Gain Due To Products 	
6.	Condensers	<ul style="list-style-type: none"> ▪ Factor Affecting the Condenser Capacity ▪ Classification of Condenser ▪ Cooling Towers ▪ Thermal Calculation of Condensers 	
7.	Evaporators	<ul style="list-style-type: none"> ▪ Factor Affecting the Evaporator Capacity ▪ Types of Evaporators ▪ Thermal Calculation of Evaporators 	
8.	Compressors	<ul style="list-style-type: none"> ▪ Classifications: Reciprocating, Rotary, and centrifugal Compressors ▪ Work Done by Reciprocating Compressors ▪ Volumetric Efficiency of Reciprocating Compressor ▪ Rotary Compressors ▪ Centrifugal Compressors 	
9.	Expansion Valves	<ul style="list-style-type: none"> ▪ Capillary Tube ▪ Automatic Expansion Valve ▪ Thermostatic Type 	
10.	Application of Refrigeration	<ul style="list-style-type: none"> ▪ Domestic Refrigerator ▪ Commercial Refrigerator ▪ Ice Maker ▪ Water Cooler ▪ Refrigeration in Trucks & Containers 	





Evaluation Strategies:

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

Text Books & References:

1. Silberstein Whitman, Heat Pumps and Refrigeration and Air Conditioning Technology, 3rd Edition, ISBN: 0766819590 1401837654



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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Air Conditioning Lab.
Credit Hours	1
Theoretical Hours	0
Practical Hours	3



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

Brief Course Description:

Liquid Receiver, Section Accumulator, Oil Separator, Operation of the Compressor, Thermostatic Expansion Device, Automatic Expansion Device , Capillary Tube Performance, Sub Cooling and Super Heating, Evaporation in Parallel, Solenoid Valve Control, Wet Bulb and Dry Bulb Temperature Measurement, Air Condition Processes, Heating, Cooling Humidification.

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Liquid Receiver	
2.	Section Accumulator	
3.	Oil Separator	
4.	Operation of the Compressor	
5.	Thermostatic Expansion Device	
6.	Automatic Expansion Device	
7.	Capillary Tube Performance	
8.	Sub Cooling and Super Heating	
9.	Evaporation in Parallel	
10.	Solenoid Valve Control	
11.	Wet Bulb and Dry Bulb Temperature Measurement	
12.	Air Condition Processes (Heating, Cooling Humidification)	

Evaluation Strategies:

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

References:
Sheets lab.



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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Air Conditioning Systems
Credit Hours	3
Theoretical Hours	3
Practical Hours	0



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

Brief Course Description:

Introduction, Air Conditioning Processes, Air Conditioning Load Calculations, Central Air Conditioning Methods, Air Ducts and Fans, Filtration, Air Cooler Coils, Air Conditioning Equipments.

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Introduction	
	<ul style="list-style-type: none"> ▪ Air Conditioning Concepts ▪ Composition of Dry Air ▪ Dalton's Law of Partial Pressure ▪ Fundamental Properties of Wet Air ▪ Humidity Ratio ▪ Relative Humidity ▪ Wet-Bulb Temperature ▪ Specific Volume ▪ Dew Point ▪ Comfort Conditions: Temperatures, Relative Humidity ▪ Air Distribution System ▪ Filtration 	
2.	Air Conditioning Processes	
	<ul style="list-style-type: none"> ▪ The Psychrometric Chart ▪ Air Conditioning Processes ▪ Sensible Heating and Cooling ▪ Dehumidification and Humidification ▪ Adiabatic Humidification ▪ Mixing ▪ Simple Air Conditioning Cycles 	
3.	Air Conditioning Load Calculations	
	<ul style="list-style-type: none"> ▪ Definitions ▪ Air Conditioning Load ▪ System Capacity ▪ Cooling Load Calculations: Heat gain by walls, ceilings, floors, doors windows ▪ Air Change ▪ Persons ▪ Miscellaneous ▪ Fan and Ducts Load 	

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

4.	Central Air Conditioning Methods	<ul style="list-style-type: none"> ▪ Evaporating Water Method ▪ Compression Cycle ▪ Absorption Cycle 	
5.	Air Ducts and Fans	<ul style="list-style-type: none"> ▪ Air Duct: Function, specifications, Material ▪ Duct Sizing; Velocity method, Pressure Method ▪ Thermal and Sound Insulation ▪ Fittings ▪ Air Diffusing Equipment: Function, Types ▪ Grille Outlet ▪ Slot Diffuser Outlet ▪ Ceiling Diffuser Outlet ▪ Perforated Ceiling Panels ▪ Selection ▪ Fans: Function, Types ▪ Noise ▪ Position ▪ Head ▪ Selection 	
6.	Filtration	<ul style="list-style-type: none"> ▪ Air Pollution Particles ▪ Air Filter Efficiency ▪ Types of Filters: Viscous, Dry, Electrical, Centrifugal, Adsorption, Filter Selection 	
7.	Air Cooler Coils	<ul style="list-style-type: none"> ▪ Air Cooler Coils Construction ▪ Parallel and Contra-Flow ▪ Contact Coil Factor ▪ Sprayed Cooler Coils ▪ Refrigerant Cycle ▪ Air Washer ▪ Distinction between Cooler Coils and Air Washer ▪ Distinction between Cooler Coils and Heating Coils ▪ Selection 	

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8.	Air Conditioning Equipments	<ul style="list-style-type: none"> ▪ Central Air Conditioning ▪ Air Method ▪ Water- Air Method ▪ Water Method ▪ Air Handling Units ▪ Central Station ▪ Individual Room ▪ Packaged ▪ Water Chillers ▪ Cooling Tower ▪ Humidification and Dehumidification Equipment ▪ Heat Pump 	
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Evaluation Strategies:

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

References:

1. Johnson, Refrigeration and Air Conditioning Technology, 4th Edition, ISBN: 0766806677
2. Faye C. McQuiston, Jerald D. Parker, Jeffrey D. Spitler Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition, ISBN 0-471-47015-5
3. W. P. Jones, Air Conditioning Engineering, 5th Edition, ISBN 0-750-65074-5
4. Bill Whitman, Bill Johnson, John Tomczyk, Refrigeration & Air Conditioning Technology, 5th Edition, ISBN 1-401-83765-4.
5. Faye C. McQuiston, Jerald D. Parker, Jeffrey D. Spitler Heating, Ventilating and Air Conditioning: Analysis and Design, 6th Edition, ISBN: 0-471-47015-5, July 2004, Wiley

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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Heating and Sanitary Piping Workshop
Credit Hour	1
Theoretical Hours	0
Practical Hours	3



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

Brief Course Description:

- ❖ Safety rules, Tools, machinery used for heating system, Practice in heating equipment, use and care of hand and power tools, piping fabrication of copper, steel, cast iron, and plastic pipe, oil burner, boiler installation and service

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Liquid Receiver	<ul style="list-style-type: none"> ▪ Basic Safety ▪ Introduction to Hand Tools ▪ Introduction to Power Tools ▪ Introduction to Blueprints ▪ Cutting and Threading of different metal pipes ▪ Cutting and welding of copper pipes and connecting
2.		<ul style="list-style-type: none"> ▪ Assembly of radiators in sections and prepare it for installation ▪ Installation of central heating systems consist of six radiators and showing the method of connection ▪ Installation of under floor-heating system ▪ Pipes thermal insulation
3.		<ul style="list-style-type: none"> ▪ Installation of complete central heating system-Perpetration of boiler foundation, Boiler assembly, accessories installation, heat exchanger, Fuel tank and Chimney
4.	-	<ul style="list-style-type: none"> ▪ Installation of complete bathroom system with cold and hot water lines ▪ Showers, Bedizen, and electrical water heater ▪ Construction of manhole
5.		<ul style="list-style-type: none"> ▪ Burner assembly and disassembly ▪ Burner operation and fuel and air calibration ▪ Temperature and pressure calibration ▪ Exhaust gas analysis
6.	Plumbing	<ul style="list-style-type: none"> ▪ Introduction to the Plumbing ▪ Plumbing Tools ▪ Plastic Pipe and Fittings ▪ Introduction to Drain, Waste, and Vent (DWV) Systems

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



7.	Installation of different system components	<ul style="list-style-type: none"> ▪ Installing and Testing DMV Piping ▪ Installing Roof, Floor, and Area Drains ▪ Types of Valves ▪ Installing and Testing Water Supply Piping ▪ Installing Fixtures, Valves, and Faucets ▪ Fuel Gas Systems Module ▪ Servicing of Fixtures, Valves, and Faucets ▪ Installing Water Heaters 	
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Evaluation Strategies:

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



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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Refrigeration and Air Conditioning Workshops
Credit Hour	1
Theoretical Hours	0
Practical Hours	3



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

Brief Course Description:

- ❖ Safety rules, Tools, machinery associated with refrigeration, A/C systems. troubleshooting & repair, services, visits and reports.

Detailed Course Description:

الوصف	المحتوى	الوحدة
1-الأدوات و العدد المستعملة في تصنيع و صيانة أجهزة التكييف و التبريد و كيفية استعمالها. 2-الأجهزة الثابتة في مشاغل التبريد و كيفية استعمالها. 3-الحقيبة المتنقلة لفني التبريد.	العدد و الأدوات المستعملة.	(1)
1-التعرف على عدة اللحام كاملة و مكوناتها 2-أنواع الشعلات مع استخدامها. 3-التدريب على أنواع اللحام. 4-تمارين على لحام المواسير بأنواعها. 5-لحام جميع أنواع اللحام(الفضة،الحديد،النحاس،الألمنيوم،اللحام البارود...الخ). 6-عملية ربط المواسير. 7-تشكيل الصاج و بسطة و تمارين على ذلك. 8-الأنفرادات في تشكيل الصاج و تمارين على ذلك.	اللحام و ربط المواسير و تشكيل الصاج.	(2)
1-التعرف على أجزاء التبريد و معرفة طريقة عملها. 2-أنواع الثلاجات المنزلية و التجارية و غيرها. 3-الكشف على ثلاجة صالحة للتعرف على أجزائها. 4-وسائط التبريد المستعملة. 5-أنواع العوازل المستعملة في ثلاجات التبريد.	الثلاجات المنزلية و التجارية.	(3)
1-تعريف الصيانة، أنواع الصيانة. 2-الجدول النموذجية للتشغيل و الصيانة اليومية. 3-الطلبات النموذجية، لأمر الشراء، لأمر الصيانة، لأمر الإصلاح، لطلب قطع الغيار. 4-جدول نموذجية لصيانة الأنظمة الآتية: -نظام التكييف المركزي مع وحدات مناولة الهواء باستعمال مبردا لماء chiller. 5-وحدات التبريد المجمع. 6-وحدات المضخات الحرارية >Heat pump. 7-نظام التبريد و التجميد بغاز الفريون و الامونيا لمستودعات التبريد.	الصيانة	(4)

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

<p>1- التعرف إلى الأعطال الآتية: -أعطال الضواغط(الميكانيكية و الكهربائية). -صيانة مكثف أو استبداله -أعطال المبخرات بجميع أنواعها. -أعطال المكثفات بجميع أنواعها. -أعطال المراوح و مفاتيح التشغيل. -أعطال أجهزة التحكم و الحماية و التقويم. 2-عملية فك الأجهزة و المعدات التالفة و إصلاحها أو استبدالها. -فك ضاغط تالف و استبداله بجديد. -صيانة المبخرات و استبداله بأخر إذا كان لا يتم إصلاحه. -صيانة مكثف أو استبداله. -صيانة أجهزة التحكم أو استبدالها. -صيانة صمام تمدد أو استبداله. -إصلاح أو تبديل المراوح و مفاتيح التشغيل. -إصلاح أو تبديل قطع ثلاجة نوفر ست و مجاري الهواء. -عملية الكشف على التنفيس و طرق الكشف و كيفية المعالجة. -أنواع زيت التبريد المستعملة للضواغط و طرق التبريد و عملية التزويد بالزيت. -أنواع منقيات الهواء و فلاتر و سيط التبريد في أجهزة التكييف و التبريد. -عملية تعبئة الغاز.</p>	<p>صيانة أجهزة التبريد.</p>	<p>(5)</p>
<p>1-تحديد مستوى الزيت و طريقة التزويد. 2- تحديد مقدار الضغوط العالية و المنخفضة. 3-تحديد ضغط الزيت المطلوب مع المعايير. 4-صيانة فلتر الزيت. 5-صيانة صمامات الضاغطة. 6-تبريد الحافظة للضواغط المفتوحة. 7-صيانة معدات منع انتقال الذبذبات و الاهتزازات من الضاغطة إلى القاعدة. 8-صيانة جهاز فصل الزيت عن الغاز و إعادته. 9-التعرف على زجاجات الرؤية و أنواعها. 10-التعرف على كيفية تجميع الغاز في الخزانات السائل و الغاز من أجل الصيانة. 11-كيفية إذابة الثلج عن المبخرات و صيانتها.</p>	<p>صيانة أجهزة التكييف المتوسطة و الكبيرة.</p>	<p>(6)</p>



Evaluation Strategies:

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



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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	HVACR Instrumentation and control
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



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

Brief Course Description:

Measurement and Pneumatics control, Temperature measurement and control devices, Electrical control devices, Domestic Air conditioner control circuit, Air conditioning and heating control system, Temperature control system, Heating system control system,

Detailed Course Description:

Unit Number	Content		Time Needed
1.	Measurement and Pneumatics control	Testing of Measuring and Pneumatic control devices (Pressure measurements and regulators, Pneumatic relays	
2.	Temperature measurement and control devices	Operation and Testing of Temperature measurement and control devices such as different types of thermostat, Different temperature measurement devices	
3.	Electrical control devices	Operation and testing of Electrical control devices: electronic controller, amplifiers, electrical motors, automatic cutouts, relays, Fuses, magnetic switches	
4.	Domestic Air conditioner control circuit	Control loop elements, Control loop construction Defects diagnostic in the control loop: short circuit, winding cutout, relays contact melting	
5.	Heating system control system	Control loop elements, Control loop construction Defects diagnostic in the control loop	
6.	Temperature control system	Control loop elements, Control loop construction, Open and closed loop control systems, Defects diagnostic in the control loop	
7.	Air conditioning and heating control system	Control loop elements, Switching between heating and Air conditioning, Manual control, Different types of automatic control systems.	

❖ 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%	
Discussions and lecture Presentations			

References:

1. JohnI. Levenhagen, HVAC Control System Design Diagrams, ISBN 0-070-38129-1.
2. Christopher Underwood, C. P. Underwood, HVAC Control Systems: Modelling, Analysis, and Design, ISBN 0-419-20980-8.
3. John I. Levenhagen, Donald H. and Spethmann, HVAC Controls and Systems, 1st Edition, McGraw-Hill 1993, ISBN 0070375097.
4. S. Don Swenson, HVAC Controls and Control Systems, Prentice Hall, 1994, ISBN-10-0130453609





Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	HVACR Instrumentation and control 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 and control elements, Temperature, pressure, flow rate and humidity measurement and control, Control system of cooling, heating and A/C processes, Adjustment. Monitoring & troubleshooting

Detailed Course Description:

Unit Number	Content	Time Needed
1.	Pressure measurements	
2.	Pressure regulators	
3.	Temperature measurements	
4.	Thermostat	
5.	flow rate measurement and control	
6.	humidity measurement and control	
7.	Electrical controlling elements (Relay, overload, contractor)	
8.	Expansion Device	
9.	Temperature and pressure controllers	
10.	Three way controllers	
11.	Air ventilation and air conditioning control system	
12.	Solenoid Valve Controller	

Evaluation Strategies:

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

References:

Sheets lab.



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



Engineering Program

Specialization	HVACR Technology
Course Number	
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 Projects Discussions and lecture Presentations		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 وسوننتاج،ترجمة مركز الكتب الاردني ،الطبعة الثانية.



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



Engineering Program

Specialization	HVACR Technology
Course Number	
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	First Exam	20%	--/--/----
	Second Exam	20%	--/--/----
	Final Exam	50%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

Text Books & References:

Sheets lab.

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



Engineering Program

Specialization	HVACR Technology
Course Number	
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%	--/--/----
Homework and Projects		10%	
Discussions and lecture Presentations			

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



Engineering Program

Specialization	HVACR Technology
Course Number	
Course Title	Energy Conversion
Credit Hours	2
Theoretical Hours	2
Practical Hours	0



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

Brief Course Description:

Introduction and Basic concept, Energy types, solar energy, Power cycles, Energy Storage, Energy Conservation.

Detailed Course Description

Unit Number	Content	Time Needed
1.	Introduction and Basic concept	
2.	Energy types	
3.	Solar energy	
4.	Power cycles	
5.	Energy Storage	
6.	Energy Conservation	

❖ 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%	
Discussions and lecture Presentations			

References:

1. Solar engineering of thermal process, 2nd edition, duffie & Beckman, John Wiley & Sons, Inc. 1991.
2. Peter Gevorkian, Sustainable Energy Systems Engineering: The Complete Green Building Design Resource, 1st Edition
3. Moncef Krarti, Energy Audit of Building Systems: An Engineering Approach, ISBN 0-849-39587-9



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