Engineering Program

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

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 2008/2009**

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 وسونتاج،ترجمة مركز الكتب الاردني ،الطبعة الثانية.

Engineering Program

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

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