Lakehead University

Department of Mechanical Engineering

ENGI-3015-AA: Engineering Thermodynamics and Heat Transfer

Summer 2006

Course Description:

This course covers basic thermodynamic concepts and definitions, such as, concepts of thermodynamic system and control volume, properties and state of a substance, thermodynamic processes and cycles. Also, the two fundamental laws of thermodynamics – *the first law* and *the second law of thermodynamics* – are covered in an appropriate depth. Applications of the principles of thermodynamics to various engineering systems, including power and refrigeration systems and cycles are also covered in some detail. This course also provides an introduction to basic aspects of heat transfer, including heat transfer mechanisms, and application to various engineering problems.

Instructor: Dr. Basel I. Ismail, Office: CB-4047.

Regular Lecture Schedule: MTWThF. 1:00PM-3:00PM, @ AT-1003

Text Book: "Introduction to Engineering Thermodynamics," R. E. Sonntag, and C. Borgnakke, John Wiley & Sons, Inc. 2nd edition, 2007.

Grading Scheme:

1. Homework Assignments	15 %
2. Mid-Term Test: Wednesday, 16th Aug 2006, 1:00pm - 3:00pm, during class time. AT-1003	35 %
3. Final Examination: Tuesday, Aug 29th, 06, 1:00pm-3:00pm (class time). AT-1003	50 %
Total	100 %

Lecture Topics:

NOTE: The indicated sessions on each topic is approximate.

Approximate session #	Topic	Reading
1	Introduction to Engineering Thermodynamics. Definitions. Units and Conversions. Introductory concepts. Forms of energy.	Chaps. 1 & 2
2	Contd. Introductory concepts. Solved examples	Chaps. 1 & 2
3	Properties of a pure substance. Phase-change processes. Property diagrams (p-T, p-v and T-v diagrams). Thermodynamic tables.	Chap. 3
4	Solved examples.	Chap. 3

ENGI-3015-AA

ENGINEERING THERMODYNAMICS & HEAT TRANSFER

Table (2-1): some basic quantities and their units in SI and English systems

Quantity	Symbol	SI units	English units
Length	L (ℓ)	m	ft
Time	t	s	sec
Mass	M (m)	kg	lbm (slug)
Force (weight)	F (W)	N	lbf
Temperature	T	°C (K)	°F (°R)
Energy	E (e)	J (J/kg)	ft - lbf
Work	W (w)	J (J/kg)	ft - lbf
Heat Transfer	Q (q)	J (J/kg)	Btu
Power	$\dot{W}$ (P)	W	ft - lbf /sec
density	ρ	kg/m^3	lbm/ft^3
Velocity	v	m/s	ft/sec
Volume	$\forall$	m^3	ft^3
Area	A	m^2	ft^2
Acceleration	a	m/s^2	ft/sec^2
Mass flow rate	$\dot{m}$	kg/s	lbm/sec
Pressure	P	Pa, atm, $\frac{N}{m^2}$	Psi, lbf/in^2
Volumetric flow rate	$\dot{\forall}$	m^3/s	ft^3/sec.